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THE ASTRONOMICAL REGISTER.

RULES FOR CORRESPONDENTS.

1.—*Communications for insertion in the Astronomical Register must be sent in by the* **15th of the month.** *Articles received later cannot be inserted, unless containing notices of fresh discoveries, or otherwise of immediate interest.*

2.—*Each communication must be authenticated by* **name and address:** *although not for publication unless desired by the writer.*

3.—*The Editor is not responsible for any opinions expressed by correspondents: and cannot undertake in all cases to print the whole of any communication sent: neither can he undertake to preserve or return any MSS.*

4.—*It very much lessens the trouble of printing if communications are written on* **one side of the paper only;** *and it need scarcely be added, that* legible hand-writing *tends in a great degree to prevent errors, which with every care are liable to occur in printing scientific matter.*

5.—*As, owing to the numerous letters received, it is not in our power to furnish our correspondents with* **Proofs,** *it is very desirable that they should* read over and correct *their communications before sending them: when this is carefully done, there is every reason to expect that the MS. will be correctly rendered in print.*

6.—Illustrations.—*As a general rule, it is not within the means of a publication like the Astronomical Register, the circulation of which is limited, to give illustrations to letters received from correspondents, on account of the expense thereby incurred: those therefore who desire the introduction of wood-cuts, can either supply the blocks themselves, or the Editor will get them cut at cost price. The sketch must be made of a size suitable for insertion in the Register, and so far complete as to be ready to hand to the engraver, in order to avoid the delay and trouble caused when the design has to be redrawn.—Lithographic illustrations can be introduced upon similar conditions.—Notice of illustrations being required must be given early in the month.*

7.—Communications not of general interest.—*As it frequently happens that subscribers wish to write at length upon subjects which, owing to various circumstances, may not be deemed of general interest to the readers of the Register, such subscribers may have their letters inserted in the pamphlet form, or otherwise, so as to obtain the advantage of the circulation of the periodical. The expense will be about ten shillings for two pages, fourteen shillings for three pages, and for four pages and upwards at the rate of four shillings per page, but no communication of this character can be inserted singly, unless of two or more pages. Shorter letters will be postponed until sufficient are received to make four pages, of which the charge will be apportioned among the writers. N.B.—A page contains from four to five hundred words.*

8.—Reprints, or Extra Copies.—*Correspondents who require separate copies of their communications can have them at a charge of 7s. 6d. for 50 copies, if not exceeding four pages, or 12s. up to eight pages; or they can be supplied with extra copies of the Register at a reduction of 25 per cent, when more than three copies are required.—Notice must in all cases be given with the communication, when reprints are required.*

THE ASTRONOMICAL REGISTER.

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The special character of the circulation of the Astronomical Register renders it a singularly advantageous medium for advertisements of optical instruments, as well as for scientific and literary announcements in general.

Gentlemen having instruments for sale will find it to their advantage to make use of its pages: since the commencement of the publication, telescopes of the value of from £5 to £500 have been sold, which have been advertised in the Register.

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The Astronomical Register.

A Medium of Communication for all interested in the Science:

CONDUCTED BY FELLOWS OF THE ROYAL ASTRONOMICAL SOCIETY.

It is believed that up to the present time no periodical has in this country been exclusively devoted to Astronomy, with the exception of the "Monthly Notices" published by the Royal Astronomical Society. The present attempt to introduce a sort of Astronomical "Notes and Queries," a medium of communication between amateurs and others, has therefore been originated, its object being to collect together any information which may be of use either to the amateur or professional observer.

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Various Papers on Astronomical Subjects:

Proceedings of the Royal Astronomical Society:

With notices of the papers presented at the Meetings, and short reports of the discussions, &c.:

Correspondence,

On all subjects of astronomical interest, from the leading observers of the day, both professional and private:

Recent Discoveries—New Planets, Comets, &c.:

Tables of Astronomical Occurrences,

After the manner of an Almanac; the Greenwich Mean Time of every event worthy of observation during the month being given on the respective day:

Positions of the Planets:

Lists of Double Stars, Clusters, Nebulæ, &c.,

Arranged so as to facilitate the observer, and enable him to choose such objects as are best suited to the capacity of the telescope, the eye-piece, or the state of the atmosphere:

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[OVER]

PUBLISHED MONTHLY.

THE ASTRONOMICAL REGISTER.

A Medium of Communication for Amateurs and others.

CONTENTS OF THE FIRST TWO NUMBERS FOR 1865:

No. 25. JANUARY.

TO OUR READERS—*Professor Phillips'* paper on the Sun—Meeting of the Royal Astronomical Society, Dec. 9, 1864 (*Discussion on the Solar Spots, Willow Leaves, and Constitution of the Sun*)—Reviews: *The Astronomical Observer; Le Ciel*—CORRESPONDENCE: On the Dates preferred by Fireballs; *Mr A. S. Herschel*—On the Sun's Surface; *Rev. W. R. Dawes*—The Sun's Diameter; *Sir Thos. Maclear* and the *Rev. F. Howlett*—The Vast Antiquity of the Lunar Surface; *Mr Nasmyth*—On Variable Stars; *Mr G. F. Chambers*—also on the Light of the Sun—Adjustable v. adjustible—the Moon's Rotation, &c.—NOTES AND GLEANINGS: New Catalogue of Nebulæ—Solar Physics—Comet—the New Minor Planets—Mr Cooke's Great Object Glass—Award of the Royal Society's Medal to Mr De La Rue.—Astronomical Occurrences for January—Table of Nebulæ—The Planets for the month—Obituary: F. W. Struve; Professor Silliman—Correspondents' Queries and Replies—Instruments for Sale or Wanted, &c.

No. 26. FEBRUARY.

The British Association: *Dr Lee* and *Mr Birt* on the Moon's surface—The Hartwell Observatory—Meeting of the Royal Astronomical Society, Jan. 13, 1865 (*Mr Stone* on a new form of eye-piece, and on the semi-diameter of Venus; *Mr Huggins* on the occultation of the spectrum of Epsilon Piscium; *Major Tennant* on the errors of Sextants)—CORRESPONDENCE: Hind's crimson star; *Mr Chambers*—The Planet Uranus; *Mr Simkiss*—Observations at South Villa; *Rev. W. R. Dawes* The Solar Disc; *Rev. T. W. Webb*—The Sun's Diameter; *Mr Hickson*—Trapezium in Orion; *Mr Freeman*—Rotation of Satellites; *Mr Banks*—also on the Moon's Atmosphere—Visibility of stars from coal-mines, &c.—NOTES AND GLEANINGS: Bremiker's Logarithms—Celestial Chemistry, by *Mr Burr*—Planetary Distances—Encke's Comet—Large Fireball—Variable Stars, *Mr Baxendell* and *Mr Knott*. Correspondents' Queries and Replies—The Planets for February—Astronomical Occurrences for the Month—Instruments for Sale—Notices to Correspondents, &c.

With Illustrations on Wood and Stone.

"The *Astronomical Register* is a new monthly scientific periodical which we heartily recommend to our readers. It is well worth the cost, and deserves additional support from its being the first periodical devoted to astronomy that has ever, we believe, appeared in this country. It contains many matters of interest to the amateur; but the most novel and not the least useful feature is, a daily table of important coming events, like in principle but far superior in practice to those which appear in almanacs. It is also a journal of news, properly so called, narrating new discoveries and events in a form and style not to be met elsewhere. Certainly no amateur astronomer's library-table ought to be without this work."—*English Churchman, Feb.* 26.

"Under the title of the 'Astronomical Register' a new monthly has recently appeared, which we trust will in time become a worthy English representative of the German *Astronomische Nachrichten*. It really is a very useful adjunct to the 'Nautical Almanac,' and should, for this reason alone—and others might be named—commend itself to all who have telescopes and use them."—*Reader, March* 7.

"The year 1863 has amongst other events witnessed the successful starting of what is, as far as we have been able to ascertain, the first purely astronomical periodical ever issued in England. The Astronomical Register occupies a field hitherto a wide waste, and deserves to find a place on every astronomer's table."—*Quarterly Journal of Science, Jan.* 1864.

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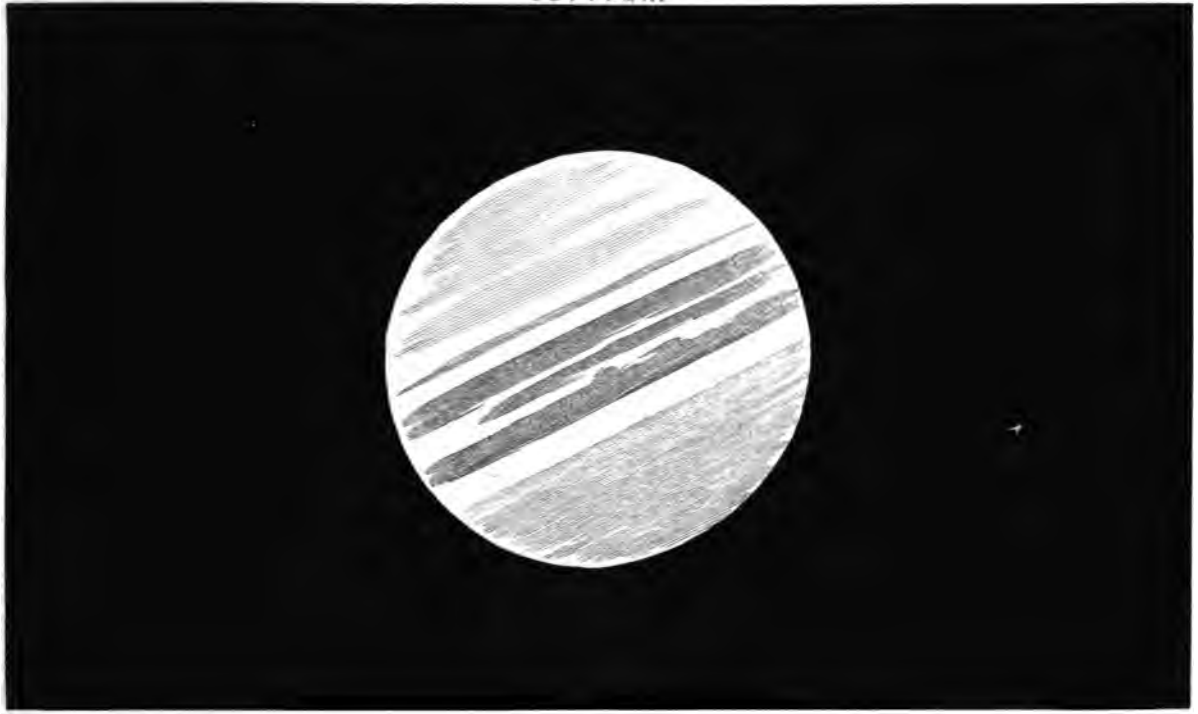

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THE

ASTRONOMICAL REGISTER:

A MEDIUM OF COMMUNICATION
FOR AMATEUR OBSERVERS, AND ALL OTHERS INTERESTED IN THE
SCIENCE OF ASTRONOMY.

VOL. I.
NOS. 1 to 12: JANUARY to DECEMBER, 1863.

LONDON:
J. D. POTTER, 31, POULTRY & 11, KING St., TOWER HILL,
1864.

LONDON:
PRIVATE PRESS, OBSERVATORY, DOWNS ROAD, CLAPTON,
1863.

INDEX TO VOLUME I.

PAGE.
Address to the Reader 1, 81, 181
Aerolite 192
Astronomer Royal, the 151
Astronomy in the Middle Ages 141
Astronomy and Astrology ... 128
Astronomy and Meteorology ... 140
Aurora Borealis... ... 9, 63, 192

Astronomical Occurrences :
  Jan. ... ... 10 July... ... 110
  Feb. ... ... 28 Aug... ... 126
  Mar. ... ... 44 Sep.... ... 142
  April ... ... 60 Oct.... ... 154
  May ... ... 74 Nov.... ... 174
  June ... ... 92 Dec.... ... 196

British Association, the 150
Balloon Ascents... ... ... 57, 73

Celestial Photography 64, 65, 117
Colonial Astronomy 90
Comets, New 73, 176, 193

Comet IV, 1862... 41
  „ I, 1863... 57
  „ II, 1863... 140
  „ III, 1863... ... ... 90, 108
  „ IV, 1863... 193

Connaissance des Temps 192
Congress of Astronomers 124

Correspondence :
  Admiral Smyth's Cycle... ... 112
  August Meteors 136
  Astronomical Facts and Figures 137
  Bedford Catalogue, the 123, 138
  Biblical Astronomy 187
  Companion of Sirius 94
  D'Orsan Controversy, the ... 79
  Effects of Atmosphere 121
  Earthquake in England ... 168
  Heavenly Bodies, Meeting of 171
  Jupiter's Satellites 95, 112, 123, 135, 150.
  Joshua Commanding the Sun to stand still 186
  Lunar Craters... 167

PAGE.
Correspondence :
  Mars 112
  Miraculous Phenomena ... 136
  Meteors 137
  New Astronomical Society ... 191
  Occultations of Stars 122, 138, 170, 169, 190.
  Parallactic Ladder 188
  Planetary Nebula... ... 122, 137
  „ Conjunctions ... 188
  Satellites of Saturn 113
  Tarnishing of Circles 25
  Venus, Inferior Conjunction 166
  „ Dark Side, of 190
  Webb, Rev. T. W., Catalogue 151, 191.

Donati's Comet 55
Double Stars, Tables of :
  Right Ascension 4 hours ... 12
  5 „ 14, 30
  12 and 13 „ ... 76
  20 „ ... 144
  22 „ ... 156

Earth's distance from the Sun 161
Earthquake in England 167, 171
Earthquake Pendulum 169
Eclipse of the Sun, 17, 78, 89, 107
Eclipse of the Moon, 79, 107, 177
Elchies Equatoreal, the ... 6, 149
Equatoreal, Sir W. Armstrong's 41
Explanation of the Tables 9, 31, 46, 153.
Extracts from Letters ... 140, 151

Gale of Wind 8
Gamma Virginis 73
Gamma Andromedæ... 198
Gold Medal, the 22

Hints to Amateurs 22

Jupiter, Opposition of 48
Jupiter's Satellites 9

Kappa Cancri 135, 151, 169

PAGE.
Large Instruments... 192
Lee Fund 151
Lord Rosse on the Nebulæ 33, 49
Literary Notices:
  Astronomy—Rev R. Main ... 90
  Astronomy of the Bible—
    Professor Mitchel 90
  Astronomy—Mr Hind 172
  Astronomy—Professor Loomis 192
  Catalogue of Stars... 124
  Solar Spots, Mr Carrington 124
Lunar Corona 9
  „ Surface, the 63
  „ Mountain, Aristarchus 101
  „ Objects 120
  „ Rainbow 151

Mars... ... ...192, 194
Meteor... 176
Milky Way, Origin of, ... 172
Moon, the... 192
  „ Map of the 140

Nautical Almanac 57
Nebulæ, Tables of:
    R. A. 10 hours 62
      „ 12 „ 77
      „ 14 „ 90
      „ 18 „ 128
      „ 20 „ 145
      „ 22 „ 157
      „ 24 „ 176
      „ 2 „ 198
Nebulæ, Remarks on 63, 78, 90
  128, 145, 176, 198.
Nebula of Orion 57
  „ Curious... 172
New Astronomical Society ... 172
Notes and Gleanings 41, 57, 73,
  90, 108, 124, 140, 151, 193.

Obituary 41
Observatory, Edinburgh... ... 40
  „ Dublin 57
  „ Cambridge 57
  „ Glasgow ... 57, 88
  „ Trevandrum ... 119
  „ Toulouse 141

Periodic Meteors 141
Planets, Positions of:
  January ... 7 July... ... 109
  February... 26 August ... 125
  March ... 42 September 139
  April ... 58 October ... 152
  May... ... 72 November 173
  June... ... 91 December 194

PAGE.
Planets, New ... 41, 73, 172
  „ Newly Named 124
Pleiades, the 89
Popular Astronomy 85

Railway through Greenwich
  Park 57
Rainfall for 1862 48
Reflector for New South Wales 57
Robbery of an Object Glass ... 25
Royal Society, the 108
Russian Observation 5

Royal Astronomical Society:
  Meeting, Nov. 14 1862 ... 2
    „ Dec. 12 „ ... 8
    „ Jan. 9 1863 ... 19
    „ Feb. 13 „ ... 36
    „ Mar. 13 „ ... 51
    „ April 10 „ ... 68
    „ May 8 „ ... 82
    „ June 12 „ ... 102
    „ Nov. 13 „ ... 182

Silvered Speculum 108
Sirius 57
Star Finder 108

Star Magnitudes 162
Stellar Parallax 124
Stellar Spectra... 54
Solar Photometry 172
Sun Spots... 41
Suggestions and Enquiries 140, 171
  192.

Temperature for 1862 48
  „ Great Variation of 119

Variable Stars 39, 56, 123, 124,
  145, 198.
  „ „ Diaphragm for,... 87
Venus, Inferior Conjunction 133, 151,
  165.
Vesta, Opposition of 176
Visitation of the Royal Observatory 108

Waterspout 151
Winnecke's Comet 140

Zadkiel's Almanac 128
Zodiacal Light 124

ENGRAVINGS.

PAGE.
The Planet Jupiter *(frontispiece)*
The Pleiades ... ... *(to face)* 81
Companions of Sirius 94

PAGE.
Lunar Crater Plato, sunrise ... 121
  „ „ sunset ... „
Path of the Planet Vesta *(to face)* 161

The Astronomical Register.

No. 1. JANUARY. 1863.

ADDRESS.

The "Astronomical Register" begs to introduce itself to all who are interested in this captivating science. Its object is to collect together those stray fragments of information, which, though not of sufficient importance, possibly, to occupy the pages of the "Monthly Notices," may nevertheless, in the shape of passing conversations, or occasional notes, be useful for future reference. It is believed, that at the present time we have no periodical exclusively devoted to Astronomy, with the exception of the "Monthly Notices," which is of course confined to the proceedings of the Royal Astronomical Society; other, and certainly not more important sciences, have each their weekly or monthly paper: the present attempt to introduce a sort of astronomical "Notes and Queries," a medium of communication for amateurs and others, has, therefore, been originated, and although of very moderate dimensions at present, it is hoped that it may meet with sufficient success to enable its projectors to extend it. Many valuable contributions to the science are now scattered in different publications; collected in one periodical they would be of far more benefit to the astronomical enquirer than they now are. The *Tables of Occurrences* for the month may possibly be found useful in saving time to the non-professional observer; many an occultation or other interesting phenomenon has been lost from an unwillingness, as it were, to be at the trouble of searching the almanacks. The *Table of Double Stars* is so arranged that the objects best suited to the capacity of the telescope, the eye-piece, or the state of the atmosphere, may be readily selected. In conclusion, the expenses of the "Astronomical Register" are confined to the charges for printing and postage, on which account a moderate subscription is necessary.

ROYAL ASTRONOMICAL SOCIETY.

The first Meeting of the Season was held on the 14th November.

Dr. Lee, *President,* in the chair.

Secretaries.—Rev. C. Pritchard and Mr. Hodgson.

Lieutenant Bailey, R.N.,
Lieutenant H. Morland, and
David Hornby, Esq.,

were ballotted for, and duly elected Fellows of the Society.

The Astronomer Royal read a paper on two subjects,—the first was, the measurement of the Earth; the second, that of the Heavens. With regard to the first he exhibited to the meeting a very interesting map, shewing the progress made in the triangulation from Valentia Bay, in Ireland, to a point in the eastern part of Russia; and with reference to the latter, he explained the means taken to correct the Sun's distance by observations of the planet Mars at opposition, adverting to the recent discoveries of M. Foucault in relation to the velocity of light, which lead to the assumption that the distance of the Earth from the Sun requires to be diminished.

Drawings of the planet Mars were shewn to the Meeting, by several Fellows of the Society.

Mr. Huggins read a paper on the "Stellar Spectrum."

A series of very large photographs of the Moon were presented to the Society by Mr. Beck.

The Meeting was very numerously attended, the rooms in fact being inconveniently crowded.

SECOND MEETING OF THE ROYAL ASTRONOMICAL SOCIETY.

Friday, December 12th, 1862.

Dr. Lee, *President,* in the chair.

Secretaries,—Rev. C. Pritchard and Mr. Hodgson.

Fifty-one presents to the Society were announced, principally from America. Mr. Pritchard observed that the Americans shewed as much progress in science as they unfortunately at present exhibited in the art of killing each other.

Lieutenant Allen Young

was ballotted for, and duly elected a Fellow of the Society.

Mr. Beck made some remarks concerning a new foreign selenographic work, illustrated with large photographic views of detached portions of the Moon's surface. These would be found to be mere copies of views taken two years ago, by Mr. Warren de la Rue, which could be proved by the fact, that a flaw existing in one of that gentleman's negatives was to be detected in these foreign pictures: moreover the effect of libration, instead of being shewn, as it professed to be, by views taken at different times, had been produced by a portion of the negative being wiped off. Mr. Beck had a microscope with which to shew this to the Fellows of the Society.

Dr. Lee exhibited a plan, by Mr. Baxendale, of the Cluster in Perseus.

The Astronomer Royal read a paper on the forms of lenses for negative eye-pieces, shewing that a *meniscus* should be used for the field lens.

Mr. Pritchard said, that as so many persons had been meddling with these eye-pieces lately, he wished to ask the Astronomer Royal, now that he was upon his legs, whether the Huyghenian eye-piece could be made more achromatic ?

The Astronomer Royal said that it could not—the Huyghenian eye-piece was achromatic in itself; but the positive eye-piece might be improved by a combination of crown and flint glass in the eye-lens.

Mr. Pritchard asked, whether the field of the negative eye-piece could be made more flat ?

The Astronomer Royal said, no—it could not be rendered more flat; indeed, so long as convex lenses were used, a flat field could not be obtained.

Mr. Pritchard, asked, whether Steinheil's eye-piece, with a meniscus eye-lens, was not achromatic?

Mr. Airy replied, that it could only be done by a compound eye-lens.

Mr. Burr observed, that he was glad his notice of the small eye-piece, some meetings ago, had called forth so much discussion on the subject, and made a few remarks on the advantage of the large field of view given by Kellner's eye-pieces.

Mr. Hodgson read a letter from the late Captain Jacob, (communicated by C. Piazzi Smyth, Esq.), written only a week before his death—mentioning, among other matter, the extraordinary decrease of brilliance of η Argus, which, from having been second only to Sirius and Canopus, was now almost overpowered by the surrounding Nebula.

Mr. Hodgson also read the following papers:—

From Mr. Knott,—on the Variable Star, R. Vulpeculæ.

From Captain Noble,—on a new method of obtaining the value of the divisions of the levels, of transit circles, &c., by means of a micrometer.

From Mr. Wray: Observations on the Visibility of the Ring of Saturn, at the time of its reputed disappearance; illustrated with two pencil sketches, taken by means of a telescope of seven inches aperture, now in possession of Archdeacon Garbett.—Power used 450.

Mr. Drach read a paper on the Gregorian Calendar.

Colonel Strange exhibited some specimens of aluminium bronze, and explained its qualities as applicable to the manufacture of astronomical instruments, having every possible advantage over brass, except cheapness.

Mr. C. Frodsham made a few remarks on the use of the new bronze in clock work, and said that he was engaged in carrying out a series of experiments as to its fitness for pendulum springs and chronometer balances.

Mr. Howlett read a paper on the Solar Spots, particularly in reference to a group on the 4th of August last, his drawings of which he had compared with photographs of the Sun, taken at the same time by Professor Sellwyn. The photographs shewed a notch in the Sun's disc, where actually there was a line of light; and he attributed it to the fact, that owing to the difference in the strength of the Sun's rays at the limb and at the centre, an exposure of the plate sufficient to give a good picture of the latter was not enough to bring out the details near the edge of the disc. Mr. Howlett stated, that the best method of viewing the spots was by throwing the reflection on a white surface about four feet from the eye-piece of the telescope, in a perfectly darkened room,—the details of the spots then came out with exceeding distinctness. Mr. Howlett's paper was illustrated with large drawings of the Sun's limb.

This Meeting was also numerously attended.

A RUSSIAN OBSERVATION.

The following is from Professor C. P. Smyth's "Three Cities in Russia."

The instrument was an altitude and azimuth of peculiar arrangement, constructed to meet the proper requisites of a travelling instrument for geographico-astronomical observations of high accuracy.

The telescope was about two feet in focal length, with the eye-end-half of the cone of rays bent out sideways through one end of the axis by a totally reflecting prism in the centre, thus completely solving the problem of easy vision at all altitudes, combined with effective illumination of the field of view.

The circles were about fourteen inches in diameter, the upper end read by microscope micrometers, the lower by verniers, with (so seldom seen in this country) the surface of the verniers in the same plane as the surface of the divided circle. The microscope micrometers were also noticeable for their illuminations, which prevented light from coming to the divisions in any other manner than parallel to the microscope's optical axis, and also made the light so coming remarkably powerful and uniform over the whole area of vision.

The entire structure was excellent in a mechanical point of view, the weight having been reduced to a minimum in every place where it was not required for strength; and where it was, it had been introduced without stint, and gave—especially to the centering of the horizontal circle, from which rose up the stout stem that afterwards branched in two to form the Y bearings of the telescope axis—a degree of massiveness and solidity in cast metal that did one's heart good to look at.

The instrument duly levelled, Captain Smythlove wished to observe the Pole star. The late evening sun was still shining, and for so small a telescope to shew the star at all, under such circumstances would surely be a feat, even if its place could be certainly found, and as clouds were rapidly collecting, it must be found quickly. Now, every observer knows well enough, that finding a small star with an altitude and azimuth instrument is not a very easy matter to accomplish quickly. The Pole star undoubtedly presents facilities over other stars of equal size, on account of its slow motion, but yet we have elsewhere known it cause a man very great plague before he could pick it up, and in every previous case in which we have seen it attempted, the observer first tried, looking out to a meridian mark, if any such were seen, to place his telescope due north, and having got this nearly, he then began to sweep up and down in altitude, until he caught the minute speck of light. Not so, however, the Russian officer; he, trained in the school of the Struves, looked at the clock, pulled out a pocket-book, where tables of trigonometrical quantities were entered, with, to us, perfectly unreadable Slavonic letters in explanation, and immediately set the telescope to the altitude of the star at that moment, within some ten seconds, quite regardless of where the north was; then, putting his eye to the eye-piece, he began to sweep round in azimuth, at his fixed angle of altitude, an assistant turning the dome at the same time, and in something under a minute and a half he had got the star in the field.

We had just time to look into the telescope, after the observation had been completed, and see for ourselves the fact of the star having been caught; note the neat little disc that it presented in the intervals of atmospheric undulations, which were every now and then apparently breaking the star into sparks, or making it crawl crabways above and below the wires,—when thick clouds came over and concealed it from further view.

THE "ELCHIES" EQUATOREAL.

In the number of the "Monthly Notices," for November last, will be found a very interesting account of the great equatoreal telescope, by the late Mr. A. Ross, which was shewn at the 1851 Exhibition. It is the property of Mr. Grant, of Elchies, Morayshire;—the focal length is 16 feet, and aperture 11 inches: the mounting, on the German plan, is by Ransome & May, of Ipswich. The declination and polar axes are about 5 feet long and 6 inches in diameter; the circles are discs of gun metal, 30 inches in diameter and one inch thick. One portion of the stand consists of 11 tons of iron, the greatest quantity ever cast into a single piece for any astronomical instrument.

The climate of Great Britain is very unfavourable to the performance of large telescopes of this character: in the "Monthly Notices," of March 10, 1854, Mr. Grant gives two drawings of Mars, one of which, taken with a five feet telescope in India, he says is "actually a little world,"—that taken with the great telescope described above is not nearly so distinct in the details,—and he adds, "I doubt whether the large glass would shew it equally well, even were the weather favourable." Professor C. P. Smyth, who made several observations with the Elchies Equatoreal last September, says "there were only two occasions during the week when I had the fortune to witness, for a few minutes each time, a cessation of those atmospheric disturbances on which the definition of stars seen in a good telescope so greatly depends." This is but another proof, that an instrument of moderate size is more generally useful in this country than one of excessive proportions.

THE PLANETS FOR JANUARY.

Mercury sets about half an hour after the Sun at the beginning of January, increasing gradually to upwards of an hour and a half at the end. About the 24th the planet will be tolerably well fixed for observation at sunset: it passes from Sagittarius into Aquarius during the month.

Jan. 1st.	R. A.	19 11 57	Dec. S.	24 30 54	Diameter	4″·6.
31st.		21 56 25	-	10 52 2	,,	8″·0.

Venus sets about twenty minutes after the Sun at the beginning of the month, and is very near to Mercury during the first week, being in the same signs; on the 31st she sets about a hour after the Sun, and may therefore be seen for a short time on favourable evenings.

Jan. 1st.	R. A.	19 9 6	Dec. S.	23 23 37	Diameter	9″·6.
31st.		21 45 17	-	15 5 58	,,	10″·0.

Illuminated portion of Venus—0·990.

Although rapidly decreasing in size, *Mars* still continues to be the most conspicuous planet in the evenings, passing the meridian at 6 41 on the 1st, and 5 42 on the 31st. It passes from Pisces to Aries during the month.

Jan. 1st.	R. A.	1 24 20	Dec. N.	9 38 52	Diameter	9″·4.
31st.		2 23 35	-	15 29 22	,,	7″·0.

Illuminated portion of Mars—0·883.

Jupiter rises about half-past one o'clock at the beginning, and about a quarter bofore twelve at the end of the month, remaining in Virgo. This planet is now getting into an unfavourable position, gradually increasing in south declination.

Jan. 1st.	R. A.	13 34 1	Dec. S.	8 27 26	Diameter 33″·0.
31st.		13 42 53	-	9 11 12	,, 36″·5.

Saturn, although like Jupiter getting gradually into a bad position for observation, is more favourably situated than the larger planet. The north surface of the ring is now again visible after a period of fourteen years. The planet, which is in Virgo, rises about half-past eleven at the beginning, and about half-past nine at the end of the month.

Jan. 1st.	R. A.	12 23 24	Dec. S.	0 0 10	Diameter 16″.2.
31st.		12 23 19	-	0 9 35	,, 16″.8.

Dimensions of Ring—Outer Major Axis, 41″. Outer Minor Axis, 4″·4.

Uranus is very well situated for observation, passing the meridian at 10 22 on the 1st, and at 8 20 on the 31st.

Jan. 1st.	R. A.	5 7 0	Dec. N.	22 58 44	Diameter 4″·0.
31st.		5 3 9	-	22 53 53	

Neptune passes the meridian about five o'clock at the beginning, and about half-past three at the end of the month, and may be seen in the western sky in the evenings.

Jan. 1st.	R. A.	0 6 36	Dec. S.	0 49 21	8th Magnitude.
29th.		0 8 31	-	0 35 51	

Juno rises about half-past twelve on the 1st, and about half-past ten on the 31st.

Jan. 1st.	R. A.	13 4 0	Dec. S.	5 15	9th Magnitude.
31st.		13 21 0	-	5 8	

Astrœa rises about ten o'clock on the 1st, and eight on the 31st.

Jan. 1st.	R. A.	10 24 0	Dec. N.	8 33	9th Magnitude.
31st.		10 20 0	-	10 36	

An exceedingly violent *gale of wind* commenced on Thursday, the 18th of December (last month), and lasted 72 hours,—the pressure of the wind reaching 20lbs. on the square foot. The fall of the barometer was very small, which is attributed to the wind previously to the gale having been from the south west, from which it changed to the north north west; had it been the reverse, it is thought the fall of the barometer would have been much greater.

On the 14th December there was a magnificent display of *Aurora Borealis*, which rendered the sky as light as if the moon had been shining.

LUNAR CORONA.—On the 28th of last month Mr. W. H. Wood writes to the *Times* from Weston-super-Mare, to say that "An unusually large non-prismatic circle was described about the Moon on the 27th, from 5 to 6, p.m., during cirrus haze; inner diameter 48 deg.; outer circumference fimbriated; northern half much brighter than the southern; sky overcast at 7 o'clock; wind S.W.

JUPITER'S SATELLITES.—No phenomena will take place with the fourth satellite of this planet during the present year 1863.

EXPLANATION OF THE TABLES.

ASTRONOMICAL OCCURRENCES.—The first column contains the days of the week; the second, those of the month. The third column contains the particulars of any event worthy of observation on each respective day. The fourth column contains the visible phenomena of the satellites of Jupiter; and the fifth, the mean time of meridian passage of the Moon, or of some star or planet, happening between three o'clock in the afternoon and midnight. In the column containing the phenomena of Jupiter's satellites, Tr. means *transit;* Sh. *transit of shadow;* I. *ingress;* E. *egress;* Ec. *eclipse;* Oc. *occultation;* D. *disappearance;* and R. *re-appearance.*

DOUBLE STARS.—These tables were originally arranged from Admiral Smyth's excellent work, the *Bedford Catalogue*, for use in the observing room, in order to prevent the destruction of that indispensable book by constantly turning over its leaves. The positions have been brought to the year 1865, to the nearest five seconds of time and thirty seconds of arc. The stars are divided into classes as follows:—

Class I.—Stars from the 1st to the 7th magnitude.
Division 1. More than 20″ apart.
„ 2. From 8″ to 20″ „
„ 3. From 3″ to 8″ „
Class II.—Stars, from the 7th to the 11th magnitude,
Divided in the same manner as in class I.
Class III.—Close stars, 1st to 11th magnitudes,
From 1·5″ to 3″ apart.

In the first column the name of the star is given at the left hand, with the magnitudes of the components, separated by the distance, underneath: this is followed by the angle of position. The second column contains the right ascension and declination, + North, - South.

ASTRONOMICAL OCCURRENCES FOR JANUARY, 1863.

DATE.		Principal Occurrences.	Jupiter's Satellites.	Meridian Passage.
Thur	1	10 3 Occultation κ^1 Tauri (5½) Reappearance 11 8. Sun rises 8 8; sets 3 59. Sidereal Time at Mean Noon, 18 42 33·8.	1st Ec. D. 13 45 25 „ Oc. R. 17 8	Moon. 9 31 36
Frid	2	9 30 Conjunction of Moon and **Uranus.** (0° 14′ N.) 11 59 Near approach of Moon to *n* Tauri. (6) 16 22 Occultation *o* Tauri, (6) Reappearance 16 47.	1st Tr. E. 14 18 2nd Ec. D. 16 12 5	10 20 30
Sat	3			11 9 18
Sun	4	15 32 Full Moon.	2nd Tr. I. 13 35 „ Sh. E. 13 44 „ Tr. E. 16 4	11 57 24
Mon	5	5 37 Occultation reappearance of *f* Geminorum. (6) 17 58 Occultation of 5 Cancri. (6) Reappearance 18 20.		Mars. 6 32 36
Tues	6		3d Ec. D. 17 41 50	6 30 30
Wed	7	13 22 Near approach of Moon to Omega Leonis. (6)	1st Sh. I. 18 17 „ Tr. I. 19 31	6 28 24
Thur	8	8 39 Occultation reappearance of 14 Sextantis. (6)	1st Ec. D. 15 38 46 „ Oc. R. 19 3	6 26 18
Frid	9	10 12 Occultation reappearance of 55 Leonis. (6) 14 6 Occultation p^2 Leonis. (6) Reappearance 14 41.	1st Tr. I. 13 59 „ Sh. E. 15 0 „ Tr. E. 16 12 2nd Ec. D. 18 45 17	6 24 12
Sat	10	14 23 Occultation B.A.C. 4006. (6) Reappearance 15 35.	1st Oc. R. 13 32 3d Tr. E. 14 52	6 22 12
Sun	11	11 14 Conjunction of Moon and **Saturn.** (7° 48′ N.) 11 54 Occultation reappearance of *q* Virginis. (6)	2nd Sh. I. 13 44 „ Tr. I. 16 13 „ Sh. E. 16 19 „ Tr. E. 18 41	6 20 12
Mon	12	12 6 Moon's Last Quarter. 22 15 Conjunction of Moon and **Jupiter.** (5° 31′ N.)		6 18 12
Tues	13		2nd Oc. R. 12 57	6 16 12
Wed	14			6 14 12
Thur	15		1st Ec. D. 17 32 6	6 12 12

DATE.		Principal Occurrences.	Jupiter's Satellites.	Meridian Passage.
Fri.	16		1st Sh. I. 14 39 ,, Tr. I. 15 53 ,, Sh. E. 16 53 ,, Tr. E. 18 6	**Mars,** 6 10 12
Sat.	17		3d Sh. E. 14 2 1st Oc. R. 15 25 3d Tr. I. 16 27 ,, Tr. E. 18 49	6 8 18
Sun	18		1st Tr. E. 12 34 2nd Sh. I. 16 19 ,, Tr. I. 18 49 ,, Sh. E. 18 53	6 6 18
Mon.	19	4 2 New Moon. 23 20 Conjunction of Moon and **Venus.** (5° 51′ S.)		6 4 24
Tues	20	13 3 Conjunction of Moon and **Mercury.** (5° 33′ S.)	2nd Oc. R. 15 29	6 2 30
Wed	21			6 0 42
Thur	22		1st Ec. D. 19 25 23	5 58 48
Fri.	23		1st Sh. I. 16 32 ,, Tr. I. 17 46 ,, Sh. E. 18 46 ,, Tr. E. 19 58	5 56 54
Sat.	24	**Mercury** well situated for observation in the evening	1st Ec. D. 13 53 41 3d Sh. I. 15 16 1st Oc. R. 17 18 3d Sh. E. 17 59	5 55 0
Sun	25		1st Tr. I. 12 14 ,, Sh. E. 13 14 ,, Tr. E. 14 26 2nd Sh. I. 18 54	**Moon.** 5 4 24
Mon	26	4 54 Moon's First Quarter. 11 31 Occultation 27 Arietis. (6) Reappearance 12 8. 5 49 Conjunction of Moon and **Mars.** (2° 12′ S.)		5 51 24
Tues	27	5 10 Occult. Delta Arietis. (4½) Reappearance 6 28.	2nd Ec. D. 13 8 53 ,, Oc. R. 18 0	6 39 0
Wed	28		3d Oc. R. 12 50	7 27 18
Thur	29	14 21 Conjunction of Moon and **Uranus.** (0° 17′ N.)	2nd Tr. E. 13 5	8 16 0
Fri.	30	**Venus** may be seen after sunset.	1st Sh. I. 18 24 ,, Tr. I. 19 37	9 4 48
Sat.	31	Sun rises 7 43; sets 4 45. Sidereal Time at Mean Noon, 20 40 50·5.	1st Ec. D. 15 46 58 ,, Oc. R. 19 9 3d Sh. I. 19 14	9 53 12

TABLE OF DOUBLE STARS, CLUSTERS, &c.

Right Ascension, Four Hours.

CLASS II.—*Division* 1.

Name of Star, &c. Magnitudes & Distance.	Position Angle.	Right Ascension and Declination.	Remarks.
μ Persei .... 4½—93"—10	231	4 5 0 +48 4	
40 Eridani .... 5—84"—9½	108	4 9 5 − 7 50½	
φ Tauri .... 6—56"—8½	242	4 12 0 +27 1	
62 Tauri .... 7—29"—8½	290	4 15 50 +23 59	
57 Persei .... 8—110"—8	200	4 23 55 +42 47	
88 Tauri .... 5—69"—8½	300	4 28 15 + 9 53	
τ Tauri .... 5—62"—8	210	4 34 10 +22 41½	
62 Eridani .... 6—64"—8	74	4 49 45 − 5 23	

CLASS II.—*Division* 2.

χ Tauri .... 6—19"—8	25	4 14 20 +25 18	
1 Camelopardi .... 7½—10"—8½	308	4 21 20 +53 37	
65 Hersc. III. Persei ... 7½—11"—9	30	4 27 20 +40 56	
55 Eridani .... 7½—10"—7½	318	4 37 5 − 9 3	
278 P. IV. Orionis ...... 8½—14"—9	49	4 55 0 + 1 25	

CLASS II.—*Division* 3.

39 Eridani	4 8 0	
5—7″—11 154	−10 36	
ω Aurigæ................	4 50 5	
5—7″—9 352	+37 41½	

CLASS III.—*Division* 1.

80 Tauri	4 22 25	
6—1″·5—8½ 15	+15 20½	
2 Camelopardi	4 29 15	
5½—1″·5—7½ 308	+53 12	
258 P. IV. Orionis	4 51 5	
8½—2″·4—9 180	+ 1 28	
61 Hersc. VIII. Aurigæ	4 58 50	
7—1″·8—8 (in cluster) 221	+37 11	

TRIPLE & MULTIPLE STARS.

257 P. IV. Tauri	4 51 35	
7—39′—8 304. —70′—10 88	+14 20	

CLUSTERS & NEBULÆ.

60 Hersc. VII. Persei...	4 0 0	
Oval group of small stars.	+49 9	
69 Hersc. IV. Tauri ...	4 0 35	
8, surrounded with nebula=3′.	+30 24½	
26 Hersc. IV. Eridani...	4 8 0	
Planetary nebula.	−13 5	

TABLE OF DOUBLE STARS, CLUSTERS, &c.

Right Ascension, Five Hours.

CLASS I.—*Division* 1.

23 Orionis .... **5**—32″—**7** 28	5 15 45 + 3 24½	
δ Orionis .... **2**—53″—**7** 360	5 25 5 — 0 24	
γ Leporis .... **4**—93″—**6½** 349	5 38 50 —22 29	

CLASS I.—*Division* 3.

λ Orionis .... **4**—4″·5—**6** 43	5 27 45 + 9 50	

CLASS II.—*Division* 1.

269 P. IV. Camelopardi **5½**—34″—**9** 349	5 0 20 +79 4½	
66 Eridani .... **6**—47″—**11** 14	5 0 5 — 4 50½	
4 Hersc. VII. Tauri ... **8**-25″-**11** (preceding a cluster) 61	5 4 15 +16 32	
λ Aurigæ.................. **5**—103″—**9½** 30	5 9 40 +39 59	
111 Tauri .... **6**—63″—**8½** 271	5 16 30 +17 15½	
ε Orionis .... **2½**—160″—**10** 68	5 29 20 — 1 17½	
78 M. Orionis .... **8½**—45″—**9** (in nebula) 32	5 39 50 + 0 1½	
37 M. Aurigæ .... **10**—25″—**10** (in cluster) 357	5 43 25 +32 30½	
α Orionis .... ***1**—160″—**11** (*variable) 155	5 47 50 + 7 23	
θ Aurigæ .... **4**—30″—**10** 289	5 50 30 +37 12	
35 Camelopardi .... **7**—30″—**10** 14	5 53 50 +51 35	

CLASS II.—Division 2.

14 Aurigæ .... 5—14″—7½	226	5 6 35 +32 32	
25 P. V. Tauri .... 8—10″—11	148	5 9 35 +19 59	
37 P. V. Tauri .... 7—9″—11	204	5 11 15 +20 0	
109 P. Orionis............ 7½—20″—10	295	5 22 10 − 8 29	
36 M. Aurigæ .... 8—12″—9 (in cluster)	309	5 27 25 +34 3	
26 Aurigæ .... 5—12″—8	268	5 29 55 +30 24½	

CLASS II.—Division 3.

ρ^1 Orionis .... 5—6″·8—8½	62	5 6 10 + 2 42	
β Orionis *(Rigel)* ...... 1—9″·5—9	199	5 8 0 − 8 21½	
39 Hersc. VII. Aurigæ 9½—5″—11 (in cluster)	235	5 19 0 +35 12	
118 Tauri .... 7—5″—7½	196	5 20 55 +25 2½	
362 H. Orionis .... 6—5″—9	59	5 28 50 − 4 26½	

CLASS III.—Division 1.

κ Leporis .... 5—3″·7—9	359	5 6 55 −13 6	
20 P. V. Tauri............ 8—2″·1—8½	168	5 8 55 +18 17	
84 P. V. Orionis .... 8—2″·6—10	322	5 18 10 + 1 48	
33 Orionis .... 6—2″—8	26	5 24 10 − 3 11½	

N. B.—Owing to the number of objects in the 5th hour of R. A., it is necessary to postpone several until our next.

INSTRUMENTS, &c., FOR SALE.

Applications respecting prices and other particulars to be made to the Editor of this paper—if by letter, enclosing stamp for postage of answer.*

Astronomical Telescope, 8 feet focal length, 5½ inches aperture, mounted on an Equatoreal Stand. (1)

Astronomical Telescope, 7 feet focal length, 4½ inches clear aperture, on a Varley Stand. (2)

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Equatoreal Mounting, (for latitude 51 or 52,) adapted for a telescope of 6 or 7 feet focus. Circles, 12 inches, and Driving Apparatus, all of the most approved construction. (5)

NOTICE.—The ASTRONOMICAL REGISTER is intended to appear at the commencement of each month: the subscription will be Two Shillings per Quarter.

The pages of the Astronomical Register are open to all suitable communications; letters and articles for insertion to be addressed to Mr S. Gorton, Stamford Villa, Downs Road, Clapton, N. E., from whom the paper may be obtained.

CONTENTS.

Page
ADDRESS 1
Meeting of the Royal Astronomical Society, November 14 2
———— ———— ———— December 12 3
A Russian Observation 5
The "Elchies" Equatoreal 6
The Planets, for January 7
Astronomical Occurrences for January 10
Table of Double Stars, Clusters, &c., ... 12
Instruments for Sale, &c., ... 16

* These notices are inserted free of charge to Subscribers.

J. H. DALLMEYER,
19, Bloomsbury Street, London, W. C.

PRIZE MEDAL, INTERNATIONAL EXHIBITION, 1862.
——*For "Equatoreal Telescopes—for his excellent Object Glasses and Equatoreal mountings."*

For further particulars, of Microscopes, Photographic Lenses, etc., see Catalogues, which may be had upon application as above.

LONDON: Private Press—Observatory, Downs Road, Clapton.

The Astronomical Register.

No. 2. FEBRUARY. 1863.

THE TOTAL SOLAR ECLIPSE *of July 18th,* 1860.

The Bakerian Lecture on this subject delivered on the 10th April, 1862, before the Royal-Society, by Warren De la Rue, Esq., Ph. D., F.R.S., has just been published, and contains the only complete account yet given of any results of the "Himalaya" Expedition.

Mr. De la Rue determined on attempting to photograph the red prominences, and took with him the Kew Photoheliograph, with a portable observatory and staff of assistants, provided with a large stock of chemicals, his baggage altogether weighing 34 cwt. Starting from Plymouth in the Himalaya on the 7th July, they landed at Bilbao on the 9th, and by the kindness of Mr. Vignoles, engineer of the railway then constructing, the apparatus was safely established at Rivabellosa, near Miranda de Ebro, seventy miles distant, on the 11th. A photograph of the Sun was obtained on the 14th, but the weather interfered sadly with all preliminary operations, and on the day of the Eclipse it was only within a short time of its commencement that the Sun appeared, and in fact at many stations the observers were deprived of all opportunity of observation. Upwards of thirty photographs, of four inches diameter, were taken during the Eclipse, shewing beautifully the progress of the Moon over the Sun's disc, and two most successful ones during the totality, which were allowed one minute exposure each. This was done on account of the fear that the prominences possessed insufficient light to impress themselves sooner, but the result shews that they have a very high actinic power, and might have produced nearly instantaneous pictures. Mr. De la Rue also made two hand drawings during the totality, by means of an excellent telescope by Dallmeyer, furnished with a reflecting eye-piece, which agree admirably with the photographs; but the latter process shews its superiority in presenting several important protuberances which have depicted themselves, and proved their existence, although Mr. De la Rue is certain they were not visible to the eye in his telescope. Without fac-similes of the photographs, it is difficult to refer to their peculiarities; but it may be mentioned that in the first picture there is seen on the east of the Sun's limb a totally detached pink cloud, and near it a projection of the curved or boomerang form, which has generally been seen in total solar eclipses, besides a fringe of prominences round a considerable part of the eastern side; while in the second photograph these are more or less covered by the Moon's advance, and a fine series of prominences uncovered on the western limb. Their light is estimated at 180 times that of the Moon, but 1100 times less than the Sun. From the photographs, when subjected to most accurate measurement with an apparatus devised for the purpose, it has been conclusively shewn that the prominences belong to the Sun, and not to the Moon, as in the former case they would change their position angle with respect to the Moon's centre during the totality, which is found to be the case, and would be uncovered and covered according to their position with respect to that centre, while the Moon's disc was passing. The Lecture also contains other valuable results of the measurements of the Eclipse Photographs, before and after totality, as checks upon the calculated diameters of the Sun and Moon and their respective paths in the heavens. Some other photographs of the totality were taken at Desierto de las Palmas, near Valencia, on the Mediterranean Coast, by Father Secchi, assisted by Senor Aguilar and Professor Monserrat with a refractor of nine inches aperture, which it is most satisfactory to find corroborate Mr. De la Rue's most perfectly, shewing only those differences due to difference of latitude, and none due to parallax, which would have been visible had the red prominences belonged to the Moon. The volume before us is splendidly illustrated by coloured drawings of the totality; fac-similes of the photographs and hand drawings; positive photographs, copied from those produced by the actual negatives taken, and numerous other valuable aids to the understanding of the Paper. It is also right to mention that Mr. De la Rue defrayed the greater part of the expenses of the operation, which exceeded by some hundreds of pounds the sum allowed by the Royal Society, and both he and the scientific public must be congratulated on the successful result of one of the most important astronomical expeditions ever undertaken.

T. W. B.

ROYAL ASTRONOMICAL SOCIETY.

Third Meeting, January 9th, 1863.

Dr. LEE, *President,* in the Chair.

Secretaries.—Rev. C. Pritchard and Mr. Hodgson.

Among the Presents to the Society was a volume, by Mr. De la Rue, on the Solar Eclipse of 1860.

The usual periodicals, &c., had also been presented to the Society.

Richard Munday, Esq., R.N.
Major Walker, Royal Engineers,
A. I. Melhuish, Esq., and
Henry Morgan E. Crofton, Esq.,

were balloted for and duly elected Fellows of the Society.

The following were the Papers presented at the Meeting:

"Results of Observations of small Planets, Phenomena of Jupiter's Satellites, &c." from the Royal Observatory, Greenwich.

"Observations of Asteroid 67," made at the Liverpool Observatory.

"Observations of Asteroids 71 and 75," by Dr. Peters, Hamilton College.

"Observations on a large Comet," by Mr. Tebbutt, in Australia. Mr. Hodgson observed that Mr. Tebbutt was the gentleman who discovered the great Comet of 1861, but did not get the proper amount of credit for it.

Mr. Baxendale, "On the Variable Star, η Geminorum."

"Observations and Drawings of Mars," by Mr. Joynson,—telescope 3½ in. aperture, by Cooke & Sons—power 170.

"Observations on Comet II, 1862," at the Observatory of J. G. Barclay, Esq., Leyton, Essex.

A communication from Mr. Dawes, already printed in the "Monthly Notices," was read, referring to a group of Stars, which Professor C. P. Smyth, observing with the Elchies Equatoreal, asserts to have varied very surprisingly in magnitude since measured by his father in

1834. Mr. Dawes stated that the Elchies Refractor had not shewn the Star B at all, which ought to have been obvious enough in such a glass.

Mr. Pritchard asked Mr. Dawes if it was not a very extraordinary thing in the annals of observers and telescopes, that this glass had not shewn the Star in question?

Mr. Dawes replied that it certainly was.

Capt. Noble observed that many of the Stars in the "Cycle" required revising as to magnitudes; for instance, he could not see No. 5 in the Cycle,* of the 13½th magnitude, while he was able to observe some of the 15th magnitude.

Mr. Pritchard asked whether it was not possible that in the case in question of the Elchies Instrument, the eye of the observer might have been in an abnormal condition? At any rate he was bound in honour to re-observe the Star.

Colonel Strange asked whether the Star was a coloured one?

Mr. Dawes replied—No; that there was nothing unusual about it.

The object glass of the Elchies Equatoreal was stated to be a Munich one.

Mr. Dawes said he observed this Star on an unfavourable night; in fact, Mars was so indistinct he would not look at it; nevertheless he thought it was a fair comparison with what the atmosphere at Elchies usually was.

Mr. Hodgson read a note from Mr. Knott on the same subject, in which he stated that all four components were readily visible in his refractor, of seven inches aperture, by Alvan Clark.

The Astronomer Royal mentioned that some observations made at Greenwich on Saturn had been compared with others made by Struve; the latter record certain appendages observed which are considered not to belong to the Ansæ of the ring, but Mr. Airy said the Greenwich observer did not notice them, although from his known care it was scarcely possible he could have overlooked anything of the kind. The Greenwich Equatoreal was very little smaller than Struve's instrument.

A letter was read from Herr Auwers, of Gotha, on the Parallax of Stars, the result of researches carried out at Konigsberg. Mr. Pritchard asked if the Astronomer Royal would kindly give the meaning of the letter in plain words.

---

* No. 4. 34 Piscium. 6—7″—13½.

The Astronomer Royal said the meaning was this—that Bessel found the Parallax of 61 Cygni to be

0″·366, with a probable error of 0″·012;

while Struve, with whom Auwers very nearly agreed, found it to be

0″·5107, with a probable error of 0″·0282.

Mr. Pritchard asked what was the Astronomer Royal's own opinion as to these probable errors?

Mr. Airy—I say those probabilities are not worth a pin.

Mr. Pritchard—Does it not throw a considerable doubt on the whole subject of Parallax?

The Astronomer Royal replied that to some degree it certainly did.

Mr. Hodgson said that Auwers had deduced his results not only from 61 Cygni, but from another Star also.

Mr. Carrington said, that although the probable error of one observation might not be "worth a pin," yet the result of many observations was very correct. The term "probable error" did not exactly express the meaning intended to be conveyed.

Mr. Pritchard said, that the real value of the thing consisted in the honest account which each observer gave of his own results.

In reply to further questions Mr. Airy stated, that notwithstanding discrepancies the existence of Parallax of the Fixed Stars had been proved beyond all doubt.

Mr. De la Rue exhibited a photograph of the Moon, the same size as the large map of Beer and Madler. He stated that after the labour of four or five years, and the taking of above four hundred photographs, not more than fourteen were produced of the character of that exhibited. Mr. De la Rue mentioned also, that on his recent visit to Rome, he had seen Father Secchi, the director of the Observatory, who had shewn him photographs of the Eclipse of the Sun in 1860. The photographs sent to this country did not exhibit the details which were to be found in his (Mr. De la Rue's); but that was owing to their having been "heightened" (or improved). He had, however, copied one of the original negatives at Rome, and comparing it with his own, it was immediately evident that the appearance of the luminous prominences, taken at two stations a considerable distance apart, was absolutely the same.

Mr. Carrington made some observations on a recent communication from Sweden relating to Halley's Comet, two inequalities of which had been discovered in a very simple manner. He considered this subject worthy of great attention.

After a few further remarks on the same subject the meeting adjourned.

THE GOLD MEDAL.—We are informed upon good authority, that the Gold Medal of the Astronomical Society will be given this year to *M. Argelander.*

HINTS TO AMATEURS.

Open air observations——Observing in a room——Wrapping up——The Telescope to be firmly fixed——Bright light to be avoided——South view best.

It is allowed by all who have any experience on the subject that the open air is the best place for using a telescope upon celestial objects. It requires, however, a large amount of enthusiasm on the part of a beginner to encounter the various difficulties with which this is attended, when the observations are to be made in the night time. Taking the telescope out into the garden, arranging the stand, etc., to find, perhaps, the weather change, and the sky become overcast just as the instrument is ready for use. Here, however, the beginner may be reminded that one maxim must be steadily remembered—"never be disappointed by the weather;" in this uncertain climate an Astronomer who should yield to vexation because the sky becomes thick, had better give the thing up altogether. There are in reality fine nights enough, as any one who has gone a little way into the subject will soon discover; for even with an amateur, Astronomy does not consist entirely of gazing at the Stars; there is abundant occupation for dull evenings in recording what has been accomplished and arranging what has still to be done. Those, however, who undertake the trouble of observing in the open air, will be repaid by the command of the heavens which is thereby acquired, and the great steadiness obtained from the instrument being actually upon *terra firma.*

When observing in a room, it is necessary that all doors and windows should be closely shut, excepting that at which you are using the telescope—this should be opened as widely as possible. You will then experience little or no draught, which is equally prejudicial to the observer and to the performance of the instrument. By means of a great coat, a thick wrapper, and a warm cap for the head, you will be effectually protected from cold, for it need scarcely be remarked that there must be no fire in the room.* It is not, however, advisable to use the telescope on very cold evenings (unless any thing particular is to be seen), as when any frost is present in the air, it interferes materially with definition. The same thing may be said of an east wind.

The table upon which the telescope is placed should be firm and steady. If the instrument can be fixed up on the window-sill, it is better, as it will then be free from the vibration of the floor: vibration is perhaps the greatest annoyance which the beginner has to encounter; those accustomed to the use of a terrestrial telescope only, have scarcely an idea of its extent. In some early efforts to overcome this evil, we arranged the head of the telescope-stand upon a strong piece of timber about four inches square, and of a length corresponding to the width of the window, across which it was fixed by means of large screws at each end. For a small instrument, perhaps, there is no better plan than the portable clip, screwed into the under side of the window-sash; the telescope then hangs as it were to a universal joint, and by means of raising and lowering the sash, the most convenient height for the instrument may be secured. These clips can be obtained at most opticians.

The observer must likewise be steadily and comfortably seated; a music stool with a screw seat; a chair used the reverse way, so that the arms may rest on the back; a large book or two to raise the body to the required height; in one way or other the head, the arms, and the body must be steadily at rest, or no observation can be made with precision.

When engaged upon small Stars, Nebulæ, or other faint objects, use no more light than you can possibly help; it will be all the better if you know where to put your hand on the eye-pieces, etc., in the dark. The eye cannot perceive a faint object if it has been subjected even to a moderate light, and rest for a short time in total darkness is the best preparation for this kind of work. A small lantern, with means of shutting off the light is exceedingly useful; in fact necessary, and a little constant attention paid to the lamp, keeping it properly trimmed and supplied with oil and wick, will not be thrown away.

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* A friend of ours highly recommends a "wadded dressing gown," and states that he has carried on operations with impunity during the coldest evenings when so provided.

It is a terrible nuisance if it refuses to burn properly when wanted in a hurry.

For a telescope not equatoreally mounted, it is always of great importance to obtain a view towards the south. With regard to ordinary observation, the telescope need not be accurately in the meridian; a window in a southerly direction is all that is required. If the view be to the east or the west, the Stars will not pass in a horizontal line through the field of the instrument; and at first, owing to the eye-piece "inverting," this will create more than a little confusion. Moreover, the nearer the Star passes in a straight line, the more easy will it be to make the telescope follow it, which, when close to the meridian, it will do with a movement of the vertical axis only; when east or west, the object will cross the field of view diagonally, and require both the vertical and horizontal movements to be brought into play.

When pointed towards the south, the Stars enter the field on the right-hand side, and pass off at the left: if the telescope is pointed to the east, the Star enters the upper part of the field on the right, and leaves it at the lower part on the left hand; looking towards the west, the Star appears to rise in the lower part of the field of view on the right, and leaves it at the top on the left-hand side.

To a beginner, the fact of the Star which is setting appearing to rise in the telescope, causes some hesitation as to the direction in which he should move the tube in order to follow it, and practice alone will enable him to work the instrument so as to keep the Star steadily in the field.

RAINFALL FOR THE LAST YEAR.—We extract from the *Times* of Jan. 10th the following statement of the fall of rain in 1862:

January	4·07	inches.	July	4·54	inches.
February	0·86	„	August	4·09	„
March	4·15	„	September	4·90	„
April	3·24	„	October	7·13	„
May	4·39	„	November	2·43	„
June	4·83	„	December	4·38	„

Total .... 49·01 inches.

The fall in 1858 was .... 36·09 inches.
„ 1859 „ .... 37·35 „
„ 1860 „ .... 46·04 „
„ 1861 „ .... 47·62 „

CORRESPONDENCE.

N.B.—We do not hold ourselves answerable for any opinions expressed by our correspondents.

TARNISHING OF SILVERED CIRCLES.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—Having experienced great annoyance from the silvered circles of an instrument tarnishing, I tried the experiment of coating a portion of them with *cold lacquer* applied with a small brush; I am glad to say I found the result more than equal to my expectations, for the portion so coated, after a year or so's use, is as perfect as at first; the other parts, owing to their becoming quite black with tarnish, having had to be cleaned repeatedly.

The silver surface when coated with the cold lacquer has a deadened appearance, which renders the reading of the divisions by the microscope very agreeable to the eye.

I am, Sir,
Yours obediently,
C.

SINGULAR ROBBERY OF AN OBJECT GLASS.—On Saturday evening the 3rd of January, a respectable clerical looking man, called at Mr. Slater's, in Euston Road, and inspected the telescopes which that gentleman exhibits in front of his house. He was particularly interested in the mountings, and also in the manner of fitting the object glasses into their cells. After making several remarks on the grandeur of the Science of Astronomy, the wonderful works of the Creator, &c., he proposed to give Mr. Slater's assistant five shillings and sent him into the house to get change for a sovereign, at the same time asking Mr. Slater to be so good as to call a cab for him. This was done, and he drove off "to the Paddington Station." Scarcely was he out of sight, when it was discovered that the object glass of the telescope, which had elicited so much praise, was missing. In great haste Mr. Slater pursued with a Hansom, and met the cab returning, the driver stating that the gentleman had suddenly recollected an engagement, and had got out in Portland Place. The object glass was one of six inches in diameter, in preparation for the Rev. Professor Sellwyn.

THE PLANETS FOR FEBRUARY.

Mercury will not be well situated for observation in February, but may be seen in the mornings towards the end of the month. It passes from Aquarius to Capricornus.

Feb. 1st.	R. A.	21 56 20	Dec. S.	10 34	Diameter	8″·6.
28th.		21 3 50	-	15 51½	,,	7″·8.

Venus may be seen in the evenings, setting due west, rather more than an hour after the Sun, at the beginning, and nearly two hours after at the end of the month. The Planet passes from Aquarius to Pisces.

Feb. 1st.	R. A.	21 50 10	Dec. S.	14 41	Diameter	10″·0.
28th.		23 56 6	-	1 43½	,,	10″·4.

Illuminated portion of the disc of Venus 0·965.

Mars passes from the Constellation of Aries into Taurus during February, and still continues to be well visible in the evenings, setting about an hour after midnight at the beginning, and about an hour before midnight at the end of the month.

Feb. 1st.	R. A.	2 25 45	Dec. N.	15 40½	Diameter	7″·0.
28th.		3 28 4	-	20 15½	,,	5″·8.

Illuminated portion of the disc of Mars 0·891.

Jupiter rises in the east shortly before midnight at the beginning of the month, and remains in the Constellation of Virgo. At the end of February it rises about ten minutes before 10 o'clock. The Planet is still too low for any good observations of the Satellites to be made before midnight.

Feb. 1st.	R. A.	13 43 1	Dec. S.	9 11½	Diameter	36″·4
28th.		13 41 58	-	8 59	,,	39″·2

Saturn continues in the same Constellation, and rises nearly two hours before Jupiter.

Feb. 1st.	R. A. 12 23 13	Dec. N. 0 10½	Diameter	16″·8
28th.	12 18 20	- 0 48½	„	17″·4

Dimensions of Ring—Outer Major Axis, 43″. Outer Minor Axis, 4″.

Uranus continues well situated for observation in the Constellation of Taurus.

Feb. 2nd.	R. A. 5 3 1	Dec. N. 22 53½	Diameter 4″.
26th.	5 2 12	- 22 52½	

Neptune also continues visible in the western sky.

Feb. 2nd.	R.A. 0 8 54	Dec. S. 0 33½.
26th.	0 11 40	- 0 14½.

THE MINOR PLANETS.

Juno:	Feb. 10th.	R. A. 13 22	Dec. S. 4 34	Meridian Passage 16 0
Mag. 9·6	20th.	13 21	- 3 44	„ 15 19
Astræa:	Feb. 10th.	10 14	Dec. N. 11 54	„ 12 51
Mag. 8·9	20th.	10 6	- 13 17	„ 12 4
Victoria:	Feb. 10th.	9 14	Dec. N. 2 31	„ 11 52
Mag. 10·7	20th.	9 5	- 3 20	„ 11 3

The following Minor Planets also pass the Meridian, between 5h. and 12h. in February; their places are given in the Supplement to the Nautical Almanac for the year 1866.

Thetis	......Magnitude 10·7	Ariadne	......Magnitude 10·9
Calliope	„ ... 9·9	Hestia	„ ... 12·0
Themis	„ ... 11·4	Virginia	„ ... 12·3
Phocea	„ ... 12·0	Europa	„ ... 10·0
Bellona	„ ... 9·2	Melete	„ ... 12·9
Urania	„ ... 10·0	Asia	„ ... 12·3
Circe	„ ... 11·5		

ASTRONOMICAL OCCURRENCES FOR FEBRUARY, 1863.

DATE.		Principal Occurrences.		Jupiter's Satellites.		Meridian Passage.
Sun	1	13 5 14 17	Occultation, *f* Geminorum (6) Reappearance of ditto	1st Sh. I. ,, Tr. I. ,, Sh. E. ,, Tr. E.	12 53 14 5 15 7 16 17	Moon. — 10 40·7
Mon	2	1 53 18 44 14 26	Conjunction, Venus and Mercury, 3° 54′ N. Occultation, 29 Cancri (6) Reappearance of ditto	1st Oc. R.	13 37	11 26·9
Tues	3	10 25	Full Moon	2nd Ec. D.	15 42 34	12 12·1
Wed	4	15 31 16 39	Occultation, 14 Sextantis (6) Reappearance of ditto	3d Ec. R. ,, Oc. D. ,, Oc. R.	11 59 48 14 22 16 36	Mars. — 5 35·3
Thur	5	14 28 15 40 17 4 17 23	Occultation, B. A. C. 3726 Reappearance of do. (6) Occultation, 55 Leonis (6) Reappearance of ditto	2nd Tr. I. ,, Sh. E. ,, Tr. E.	13 9 13 20 15 34	5 33·6
Frid	6	9 9 9 26	Occultation, *e* Leonis (5) Reappearance of ditto			5 31·9
Sat	7	15 45 18 13 19 14	Conjunction, Moon and Saturn, 7° 44′ N. Occultation, *q* Virginis (6) Reappearance of ditto	1st Ec. D.	17 40 15	5 30·2
Sun	8			1st Sh. I. ,, Tr. I. ,, Sh. E. ,, Tr. E.	14 46 15 55 17 0 18 7	5 28·5
Mon	9	6 10 20 49	Conjunction, Moon and Jupiter, 5° 18′ N. Mercury, inferior conjunction	1st Ec. D. ,, Oc. R.	12 8 37 15 27	5 26·8
Tues	10	22 46	Moon's Last Quarter	1st Sh. E. ,, Tr. E. 2nd Ec. D.	11 28 12 34 18 16 25	5 25·1
Wed	11			3d Ec. D. ,, Ec. R. ,, Oc. D.	13 29 42 15 56 21 18 7	5 23·4
Thur	12			2nd Sh. I. ,, Tr. I. ,, Sh. E. ,, Tr. E.	13 21 15 37 15 54 18 2	5 21·8
Frid	13					5 20·1
Sat	14			2nd Oc, R.	12 9	5 18·5
Sun	15			1st Sh. I. ,, Tr. I. ,, Sh. E.	16 39 17 44 18 53	5 16·9

DATE.		Principal Occurrences.		Jupiter's Satellites.		Meridian Passage.
Mon.	16	15 32	Conjunction, Moon and Mercury, 1° 14′ S.	**1st** Ec. D. ,, Oc. R.	14 1 55 17 16	Mars. — 5 15·3
Tues	17	15 6	New Moon	**1st** Sh. I. ,, Tr. I. ,, Sh. E. ,, Tr. E.	11 7 12 11 13 21 14 23	5 13·6
Wed	18			**1st** Oc. R. **3d** Ec. D.	11 43 17 27 19	5 12·0
Thur	19	2 18	Conjunction, Moon and Venus, 6° 55′ S.	**2nd** Sh. I. ,, Tr. I. ,, Sh. E.	15 55 18 2 18 28	5 10·5
Fri.	20	13 6	Conjunction, Mars and Delta Arietis, 6m ·2 W.			5 8·9
Sat.	21			**2nd** Oc. R.	14 33	5 7·3
Sun	22			**3d** Tr. I. ,, Tr. E. **1st** Sh. I.	11 22 13 29 18 32	5 5·7
Mon	23	7 8 20 35	Near approach of Moon to ρ^2 Arietis (6) Conjunction, Moon and Mars, 0° 24′ S.	**1st** Ec. D.	15 55 15	5 4·2
Tues	24			**1st** Sh. I. ,, Tr. I. ,, Sh. E. ,, Tr. E.	13 1 13 59 15 14 16 11	Moon. — 5 20·5
Wed	25	0 34 21 12	Moon's First Quarter Conjunction, Moon and Uranus, 0° 30′ N.	**1st** Ec. D. ,, Oc. R.	10 23 32 13 31	6 9·6
Thur	26			**1st** Tr. E. **2nd** Sh. I.	10 38 18 30	6 58·6
Fri.	27	9 45 11 0 10 23	Occultation, 15 Geminorum(6) Reappearance do. Near approach of Moon to 16 Geminorum (6)			7 47·2
Sat.	28			**2nd** Ec. D. ,, Oc. R.	12 41 44 16 55	8 34·9

TABLE OF DOUBLE STARS, CLUSTERS, &c.

Right Ascension, Five Hours.

CLASS III.—Division I.

Close Stars, from the 1st to the 11th Magnitude, 1″·5 *to* 3″ *apart.*

Name of Star, &c. Magnitudes & Distance. Position Angle.	Right Ascension and Declination.	Remarks.
52 Orionis .... **6**—1″·8—**6½** 200	5 40 45 + 6 24½	
225 P. V. Aurigæ ...... **8**—3″·8—**8½** 61	5 41 5 +31 44	

Triple and Multiple Stars.

ι Orionis (*triple*)......... **3½**—11″·5—**8½**—49″—**11**	5 28 50 — 6 0	
124 Tauri (*quadruple*)... **10**—82″—**8½**—98″—**8**—5″—**9**	5 31 0 +23 14½	
σ Orionis (*multiple*) ... **4**—12″·5—**8**—41″—**7** } Double **9**—8″·5—**8½**—68″—**8** } Triple Star	5 32 0 — 2 41	
ζ Orionis (*triple*)......... **3**—2″·5—**6½**—56″—**10**	5 33 55 — 2 1	

Clusters and Nebulæ.

79 M. Leporis .... Stellar Nebula.	5 18 50 —24 38½	
38 M. Aurigæ .... Cluster with wide double, **7** and **9**	5 20 20 +35 46½	
261 Hersc. I. Aurigæ ... Nebula, in field of minute stars.	5 22 30 +34 8½	
1 M. Tauri .... Large oval nebula.	5 26 20 +21 55	
θ Orionis .... **6**, **7**, } The Trapezium in the **7½**, **8**, } Great Nebula of Orion.	5 28 40 + 5 29	
34 Hersc. IV. Orionis... Planetary nebula.	5 34 40 + 9 1	

EXPLANATION OF THE TABLES.

ASTRONOMICAL OCCURRENCES.

The **First** column contains the days of the week, the **Second** those of the month; the **Third**, the hour and minute, in Greenwich Mean Time, of the various occurrences which occupy the **Fourth** column. In this latter, the particulars of any event worthy of observation are given on each respective day: the *magnitude* of the stars is denoted by figures within brackets, thus—(6); in the case of conjunctions, (viz., "Conjunction of Moon and Uranus, 0° 14′ N."), the distance and direction of the *latter* object from the former are indicated—in this case Uranus is 0° 14′ North of the Moon. The **Fifth** and **Sixth** columns contain the visible phenomena of Jupiter's Satellites; here Tr. means *Transit;* Sh., *Transit of Shadow;* I., *Ingress;* E., *Egress;* Ec., *Eclipse;* Oc., *Occultation;* D., *Disappearance;* and R., *Reappearance.* The **Seventh** column contains the *Meridian Passage* of the Moon, or of some star or planet, happening between three o'clock in the afternoon and midnight.

It must be remembered that these Tables are not intended to do away with the necessity of referring to the *Nautical Almanac;* the fact of an event is merely pointed out, with the time of its occurrence, that it may not be missed—observers must seek for closer particulars in the pages of the Ephemeris.

NOTICES TO CORRESPONDENTS.

Owing to certain unexpected difficulties, but few copies of the Astronomical Register for January were issued: it will be forwarded to Subscribers with the present number.

As a work of this nature is peculiarly liable to errors, we trust our friends will kindly point out any such that they may detect; and we may add that we shall at all times be most happy to adopt, as far as practicable, any suggestions which may be made, tending to render our pages more intelligible or useful.

We beg to express our thanks to the Rev. W. R. Dawes for his valuable communication.

The Astronomical Register is intended to appear at the commencement of each month: the Subscription, (for two copies of each number, including postage), is fixed at Two Shillings per Quarter, payable in advance, by postage stamps or otherwise. Single copies will be charged 4d.

Advertisements will be inserted at the rate of 6d. per line, for not less than five lines; or by special arrangement.

The pages of the Astronomical Register are open to all suitable communications: letters, articles for insertion, advertisements, &c., to be sent in not later than the 20th of the month.

The Astronomical Register may be obtained from Mr J. D. Potter, 31, Poultry, and at the principal Opticians; Subscriber's names will also be received by Mr S. Gorton, Stamford Villa, Downs Road, Clapton, N. E., to whom all communications are to be addressed.

INSTRUMENTS, &c., FOR SALE.

Applications respecting prices and other particulars to be made to the Editor of this paper—if by letter, enclosing stamp for postage of answer.—These notices are inserted free of charge to Subscribers.

Astronomical Refractor, focal length 8 feet, aperture 5½ inches, by *Tulley*, Equatoreally mounted. [1]

Astronomical Refractor, focal length 7 feet, aperture 4½ inches, on a Varley Stand. [2]

Astronomical Refractor, focal length 4 feet, aperture 3⅜ inches, complete, on a Portable Universal Equatoreal Stand. [3]

Astronomical Refractor, focal length 5 feet, aperture 3¾ inches, unmounted. [4]

Equatoreal Mounting, (for Latitude 51 or 52), adapted for a telescope of 6 or 7 foot focus.—12 inch Circles, Driving apparatus, &c., all of the most approved construction. [5]

CONTENTS.

Page
The Total Solar Eclipse of July the 18th, 1860 17
Meeting of the Royal Astronomical Society, January 9 19
Hints to Amateurs 22
Rainfall for the year 1862 24
Correspondence: Tarnishing of Silvered Circles 25
Singular Robbery of an Object Glass 25
The Planets, for February 26
Astronomical Occurrences for February 28
Table of Double Stars, Clusters, &c., ... 30
Explanation of the Tables 31
To Correspondents 31
Instruments for Sale, &c., ... 32

LONDON: Private Press—Observatory, Downs Road, Clapton.

The Astronomical Register.

No. 3. MARCH. 1863.

LORD ROSSE ON THE NEBULÆ.

In Vol. 151, Part III., of the Philosophical Transactions, recently published, is a most interesting Paper by Lord Rosse, entitled "On "the Construction of Specula of six feet aperture; and a Selection "from the Observations of Nebulæ made with them," which we think has hardly received the attention it deserves, and may probably have escaped some of our amateur friends altogether. An abstract of its contents may therefore be acceptable for reference to those who have studied the paper, and as an introduction to it for others who may not have seen it before.

His lordship commences by stating, that the observations extend over about seven years, and that although every opportunity of working is seized the climate renders the number of hours during which Nebulæ can be effectively observed very small in a year. In winter the best time for observation appears to be about 11 o'clock, after which the sky becomes luminous and faint nebulosity disappears. In summer the change is later, but the nights are short. Sir John Herschel's Catalogue has been used, and the majority of the bright and faint Nebulæ contained in it have been examined, except some near the Pole. New Nebulæ have not been systematically searched for, but many have been found, though mostly faint objects. All objects shewing features of interest, as spiral formation, dark lines or spaces, were sketched, and frequently examined. The atmospheric variations and their effect upon the Speculum constantly interfered with the employment of the higher powers; but it is thought that with the principal objects as much has been done as the present instrument is likely to achieve under existing circumstances and locality.

The author then proceeds to describe in detail the methods of casting and mounting the Specula. The general principles of these operations are doubtless known to our readers, but the great interest attaching to the construction and results of Lord Rosse's Monster Telescope will probably justify a sketch of the processes.

In the casting of a 3-foot Speculum, weighing 12 cwt., Lord Rosse arrived at the conclusion, that the mould should be formed of iron hoops, so as to cool the metal quickly, and at the same time allow of the escape of air bubbles, and this system has been carried out in producing Specula of 6-feet diameter, and weighing 4 or 5 tons, Three crucibles were used, containing 1½ tons each, of the compound of copper and tin, and in 26 hours from lighting the fires the metal was ready for casting. This was done simultaneously from all the crucibles, and accomplished in 3 seconds. In 20 minutes the metal was solid enough for the casting to be removed to the annealing oven, where it remained 6 weeks, and was then found perfect. This first Speculum was broken during the grinding, and another was then cast, which, notwithstanding that the surface was covered with minute fissures, that required two month's labour to grind out, was satisfactorily completed. A second Speculum being desirable, one was cast, but cracked in the annealing oven, and a fourth was found to be as porous as pumice stone, from the accidental presence of tallow in the mould, which was decomposed and the gasses driven through the metal. This Speculum was not annealed, and spontaneously shivered into fragments. The fifth attempt was successful, and a duplicate Speculum secured and finished by a month's grinding and polishing. This casting was only 3½ tons, and is hardly strong enough to avoid flexure in some positions.

Lord Rosse gives some exceedingly valuable hints as to the causes of defects and the mode of obviating them, and suggests many improvements, the result of his experience and experiments, for the benefit of any persons disposed to follow his example, and produce large reflecting Telescopes. The machinery for grinding and polishing is also fully described, but the detail is hardly of general interest, and can be readily referred to by those about to repeat the process.

The mounting of the Speculum is then described, but without the accompanying drawings the detail is not easily comprehended. Most of our readers are aware that the Tube is 54 feet long, and is enclosed between high stone walls, which confine the operations of the Instrument to the Meridian and about half an hour on each side of it. The Speculum is supported on a massive universal joint, and the Tube can be readily raised from the horizontal position, looking south, to the Zenith, and as far as the Pole on the north side. The weight of the Speculum is supported by an ingenious arrangement of triangular levers and balls forming 81 points of rest, which answers well, except when the Speculum is quite on its edge. The Tube is carefully counterpoised by weights which come into play as wanted, and access to the Instrument for observation is provided by a stage, with a traversing balcony, when near the ground, and by three galleries, which can he drawn out from the side walls, at greater elevations. The motion in Right Ascension is sufficiently near to Equatoreal motion as to be sufficient for most purposes. When using the micrometer at the greatest distance from the Meridian the departure becomes evident.

The Instrument, as is well known, is of the Newtonian form, and has a secondary plane Speculum for throwing the rays through the eyepiece at the side of the Tube, where, of course, the observations must be made. In the plane mirror, resort has been had occasionally to a silver surface, precipitated by chemical means, instead of the ordinary Speculum metal, but the result is not spoken of highly, and it soon tarnishes. The power most generally available when high magnifying becomes necessary is 1300, but this is sometimes exceeded, under very favourable circumstances. Having thus noticed the leading points in the construction of the Instrument, we must reserve our account of its results to another opportunity.

T. W. B.

[*To be continued.*]

Popular Astronomy.—The Cornhill Magazine for the present month contains an article entitled " A Night at Greenwich Observatory," in which the various operations there carried on are explained as they would present themselves to an observant, but uninitiated visitor. The following extracts shew the value of such an establishment as that of Greenwich, and at the same time point out the wide field necessarily open to the amateur astronomer :

> " Upon the information thus afforded depends the accuracy of all large surveys in various parts of the world. The correct position of ships at sea, the true place also of various rocks and shoals at sea, can only be found from the data supplied at Greenwich Observatory. * * * It is not from it, however, that any important discoveries connected with the nature and constitution of the various celestial bodies are likely to emanate. The whole training and work of the various members partakes entirely of the practical and mechanical. From independent observers it is most probable the next great advance will originate, though it will most likely be suggested by an examination of the facts collected and registered at the Greenwich Observatory."

ROYAL ASTRONOMICAL SOCIETY.

Fourth Meeting, February 13th, 1863.

The Annual General Meeting of the Society, Dr. Lee, *President,* in the Chair.

The Rev. S. F. Cresswell, M.A.,
James L. Shuter, Esq.,
William Essen, Esq., M.A., and
Major M. F. Ward,

were balloted for, and duly elected fellows of the Society.

The Report of the Council to the forty-third Annual General Meeting, including that of the Auditors and the Treasurer, was read by Mr. De la Rue. Of the £1000 granted by government for the establishment of the Observatory at Poonah, £500 was handed to Captain Jacob, and since the lamented decease of that gentleman Lord Palmerston had been communicated with, and the balance (£500) had been returned to the Treasury.

The Society at present consists of 444 fellows and 47 associates, shewing an increase in the former on last year, when the number of fellows was 431 and of associates 49.

Mr. Pritchard, before proceeding to read the Report as to astronomical progress and the various Observatories during the past year, adverted to the retirement of Mr. De Morgan from taking any active part in the Society, and said that the Society could not stand the loss of valuable members,—"what we want is peace and comfort, and to go on with the activity of our Society respectably and comfortably without difference."

Astronomical science has advanced with steady and interesting progress: the principal subjects alluded to being Mr. De la Rue's successful application of photography, by which the Solar Spots actually "print themselves;" and his success with regard to the Great Solar Eclipse of 1860; Mr. Bond's Monograph of Donati's Comet, a standard of excellence in astronomical publications; the confirmation by Safford and Auwers of Bessel's hypothesis as to the proper motion of Sirius and Procyon, which is explained and satisfied by the existence of invisible masses, round which Sirius revolves in about fifty, and Procyon in about forty years—these masses being comparable in magnitude with the respective stars; the inequalities in period of Halley's Comet, discovered by M. Angström; the experiments with regard to the new metal, aluminium bronze, by Colonel Strange; the spectrum apparatus in connection with the Great Equatorial at Greenwich, by the Astronomer Royal; the large Photographs of the Moon, by Mr. De la Rue; the manufacture of silvered glass mirrors of large size, at a moderate cost, by Secretan, of Paris; the completion of Mr. Carrington's Memoir on the Solar Spots; the visit of Dr. Sabel, of Wilna, to this country, to gather information as to Astronomical Photography for the Russian government; the death of Captain Jacob; Mr. Glaisher's balloon ascent; the Observations of Mars in opposition, &c. &c.

With regard to the various Observatories,—At Greenwich, the observations of Mars were under reduction, comparisons between the Solar and Stellar Spectra were about to be made, and a new catalogue of 2020 stars observed from 1854 to 1860 prepared: At Cambridge, observations of Mars and certain stars for parallax had been made, and various additions and improvements to the instruments carried out: At Oxford, Mars and Saturn had been well observed with the heliometer: Edinburgh had been occupied with perfecting the double system of time signals; this, however, had been interrupted by the great storm of February the 4th, which had in many cases actually changed the poles of the magnets: At Glasgow several gentlemen had joined together and purchased for the Observatory the large Equatoreal of the late Sir W. Keith Murray, which was now fitting up, and would be at work in the course of month or so: At Cranford, Mr. De la Rue had completed a series of 226 photographs of the Sun, from Feb. 7, 1862, to Feb. 7, 1863, taken with the Kew Photoheliograph; he had also taken a series of lunar photographs: Liverpool had been occupied with testing and rating chronometers; while at Hartwell and at Haddenham but few observations had been made, the weather and other circumstances having been unpropitious.

During the past year the Minor Planets had been increased to 77 in number, and four Comets had been discovered. The following is a list of of these objects:—

MINOR PLANETS.

73.	*Clytie,*	discovered by	Tuttle, at Harvard College, 7th April,	1862.
74.	*Galatea,*	„	Tempel, at Marseilles, 29th August,	„
75.		„	Peters, at Hamilton College, 22nd Sept.	„
76.	*Freya,*	„	D'Arrest, at Copenhagen, 14th Nov.	„
77.		„	Peters, at Hamilton College, 12th Dec.	„

Daphne also was re-discovered by Luther, on 1st Sept., 1862

COMETS.

I., by Schmidt, at Athens, on 2nd July, 1862.

II., by Swift, on 15th July, 1862, (an elliptical orbit of 142 years satisfies the Observations in this case.)

III., by Bruhns, at Leipsic, on 28th November; and

IV., by Bruhns also, on 2nd December, 1862.

Brorsen's short period Comet, has passed its perihelion unobserved.

The Obituary comprises the names of Professor Barlow, Dr. Fisher, Capt. Jacob, Mr. Rumker, and General Mitchell. The length of the proceedings prevented the Secretary from reading the notice of any but the first and last-mentioned—Professor Barlow was the author of many works—but principally known from his successful process for the correction of the compass in ships, and to astronomers as the inventor of fluid object glasses, and of the lens for increasing telescopic powers, which goes by his name. Ormsby Macknight Mitchell, commencing life as a soldier, became a professor of mathematics, a lawyer, an astronomer, a railway engineer, and ended his life in the army: the particulars of his career, as read by Mr. Pritchard, were both interesting and amusing.

The report of the Council was concluded by the list of papers read during the year, and of the contributions to the library.

THE PRESIDENT'S ADDRESS.

In rising to present the gold medal of the Society to M. Argelander, Dr. Lee noticed that it was his last time of speaking as President of the Royal Astronomical Society, and adverted in a very feeling manner to the connection he had held with them for so long a period of time. The Society had presented forty-three medals since the year 1820, and the fact that out of these, nineteen had been given to foreigners, would shew that no bias was allowed to prevail in favour of our own countrymen. M. Argelander was celebrated as the author of several works and director of various Observatories, but principally of that of Bonn, founded by Prussia. To obtain the proper motion of the stars, the method pursued is to compare two catalogues made at different intervals, each investigation then clears off numbers of uncertain and erratic positions. M. Argelander published in 1835 a catalogue of 560 stars, 390 of which had a proper motion exceeding one tenth of a second. He thence deduced the motion of the Solar System in space towards a point agreeing very nearly with that formerly indicated by Sir Wm. Herschel. This point is situated in right ascension, 259 degrees 47 minutes—north declination, 32 degrees 29 minutes. Of the splendid star charts now in course of execution at Bonn, Dr. Lee spoke in the highest terms: they comprised 30,000 stars—the observations were commenced in 1832 and terminated in 1859, during which 310,000 stars were registered.

The. President in handing the medal to Admiral Manners, the foreign secretary, begged him to assure Professor Argelander of the great admiration in which the Society held his industry and ability in sidereal investigation, and the deep interest they continued to have in his labours for the benefit of celestial science.

It was moved by Admiral Bethune and seconded by Mr. Birt,

That the Report now read be received and adopted, and printed and circulated with the President's Address. Carried unanimously.

The following gentlemen were then elected as officers and council for the present year:—

President.—G. B. Airy, Esq., M.A., F.R.S. (Astronomer Royal.)

Vice-Presidents.

Arthur Cayley, Esq., M.A., F.R.S.
Warren De la Rue, Esq., F.R.S.
John Lee, Esq., LL.D., F.R.S.
C. B. Vignoles, Esq., F.R.S.

Treasurer.

S. C. Whitbread, Esq., F.R.S.

Secretaries.

R. Hodgson, Esq.
Rev. C. Pritchard, M.A., F.R.S.

Foreign Secretary.

Admiral R. H. Manners.

Council.

Professor Adams, M.A., F.R.S.
R. C. Carrington, Esq., F.R.S.
Richard Farley, Esq.
Rev. G. Fisher, M.A., F.R.S.
Charles Fredsham, Esq.
James Glaisher, Esq., F.R.S.
J. R. Hind, Esq.
Rev. R. Main, M.A., F.R.S.
Rev. Professor Selwyn, B.D.
E. J. Stone, Esq., M.A.
Lieut. Col. A. Strange.
C. V. Walker, Esq., F.R.S.

Dr. Lee then adjourned the meeting "to the Freemason's Tavern," and the following gentlemen assembled at the Anniversary Dinner.

The Astronomer Royal.
Admiral Manners.
Dr. Lee.
Rev. Charles Pritchard.
Rev. J. B. Reade.
Rev. F. Howlett.
Messrs. Bohn.
Carrington.
Messrs. Clark.
De la Rue.
Gorton.
Lockyer.
Stone.
Walker.
Williams, &c. &c.

VARIABLE STARS.—Mr. Baxendell, of Manchester, has discovered a new variable Star in the Constellation Taurus, distant only about 19 minutes of arc from the place of the Nebula, discovered in 1852 by Mr. Hind. It is No. 705, Zone + 19°, of Professor Argelander's *Bonner Sternverzeichniss*, where its magnitude is stated to be 9·4. Its approximate mean place for 1860·0 is—

R. A. 4h. 13m. 40s., Dec. N. 19° 28′·9.

Mr. Baxendell's Observations of this Star are as follows :—

1862, March 19 = 10·4 magnitude.
Oct. 18 = 10·1 „
Nov. 15 = 9·9 „
Dec. 26 = 9·6 „
1863, Jan. 23 = 9·2 „

shewing an apparently progressive increase of brightness. In Argelander's Nomenclature this Star will be U Tauri.

Mr. Baxendell has communicated to the Literary and Philosophical Society of Manchester the following Observations on the variable Star T Tauri, near the edge of the Nebula before alluded to :—

1862, March 19 = 10·3 magnitude.
Oct. 18 = 12·5 „
Nov. 15 = 12·6 „
„ 16 = 12·6 „
Dec. 26 = 12·7 „
1863, Jan. 23 = 12·1 „

Mr. Baxendell expects a maximum of this Star to occur within the next two months. W. R. B.

[In connection with this subject, we find from the last *Monthly Notices* that "a proposal has been made to form an Association for the Systematic Observation of Variable Stars. Members of the Society and others, who may feel interested in the subject, are respectfully requested to communicate with George Knott, Esq., Observatory, Cuckfield, Sussex ; or Joseph Baxendell, Esq., 108, Stocks Street, Manchester."]

THE ROYAL OBSERVATORY, EDINBURGH.—On the 5th ult. Mr. R. M. Smith brought the condition of the Royal Observatory before the notice of the Members of the Chamber of Commerce. After alluding to the establishment of the time-ball on the Calton Hill, and more recently that of the time-gun, he said that this was but part of the work of the Royal Observatory, the chief work being the Sidereal Observations required by the government. Mr. Smith continued, "I am far from desiring to imply that our Observatory, either as regards the amount or excellence of its work, is altogether inefficient. Some departments of it are extremely effective, especially those of meridian observations of the Stars, and for the publication of true time in the most exact manner by the daily signals of time-ball and time-gun. But in many essential points it is now surpassed by all other Observatories, so as not only to mar its efficiency for the highest scientific results, but also for the most plain and useful references for commercial navigation. When the property of the Observatory was handed over to the government by the members of the late Astronomical Society, they received the promise of the government that it should be maintained ever after as a proper Royal Observatory for Scotland. Instead of this being the case, it is starved in every department. The Board of Visitors of the Royal Observatory, under their universally-respected chairman, Sir William Gibson-Craig, have again and again remonstrated against this neglect, but it has been of no avail. In the inability of the present official machinery of the Observatory and Board of Visitors to procure any rectification of its present anomalous condition, it seems not unsuitable to the business of this Chamber to make some inquiry." After some discussion the matter was remitted to a special committee.—*Scotsman, Feb.* 6.

NOTES AND GLEANINGS.

New Planet.—On Nov. 12th, Dr C. H. F. Peters, of Hamilton College, Clinton, F.S.A., discovered a new Minor Planet in the constellation Pisces, shining like a star of about the 12th magnitude.—*Ast. Nacht.* Jan. 10.—This Planet is No. 77 of the series.

Sun Spots.—The veteran Schwabe of Dessau has recently published his results for the year 1862. From them it appears that he observed the Sun on 317 days, and that the total number of groups was 160. This is a considerable falling off from the previous year, when the number was 204. The number of days when no spots were visible was only 3.

Comet IV, 1862.—The following elements of this comet have been calculated by M. Engelmann of Leipzig:—

P. P. = 1862, Dec. 28·18. B. M. T.
π = 125° 9′
☊ = 355 44
ι = 42 22
Log. q. = 9·90447

Ephemeris: *for Berlin Mean Noon.*

			h m		° ′	Brightness.
March	1	R. A.	17 46·6	Dec.	−13 54	Discovery = 1·0
	2		17 54·5		13 33	
	3		18 1·6		13 13	0·50
	4		18 9·0		12 53	
	5		18 16·4		12 33	
	6		18 23·8		12 14	
	7		18 31·2		11 55	0·44
	8		18 38·6		11 37	
	9		18 45·9		11 20	
	10		18 53·2		11 2	
	11		19 0·6		−10 45	0·38

Obituary.—On December 26th, 1862, at Lisbon, Carl Ludwig Rümker, aged 75. M. Rümker was a well known observer of the last generation; he was present at the bombardment of Algiers in 1816 by Lord Exmouth, and subsequently conducted for a period of ten years Sir Thomas Macdougal Brisbane's Observatory at Paramatta. For many years previous to his decease he was Director of the Hamburg Observatory.

The *Astronomische Nachrichten* of Jan. 26 notifies the death of Ormsby Macknight Mitchel at the age of 52. Professor (or Major General) Mitchel was the founder, and for some time Director, of the Cincinnati Observatory, and was more recently Director of the Dudley Observatory, Albany, F.S.A. At the time of his death Professor Mitchel was serving as a Major General in the army of the Northern American (Federal) States.

Sir W. G. Armstrong has resigned his post at the Ordnance Department, Woolwich. Sir William is an amateur Astronomer, and possesses a fine Equatoreal by Dallmeyer, focal length 6 feet, and 5 inches in aperture, mounted in a similar manner to that shewn in the Great Exhibition last year.

THE PLANETS FOR MARCH.

Mercury may be seen for the first few days in March early in the morning, rising about a quarter before six at the beginning of the month, and passing from Capricornus into Pisces.

Mar. 1st.	R. A.	21 6 20	Dec. S. 15 53½	Diameter	7″·6.
31st.		23 32 34	- 5 33	,,	5″·2.

Venus passes from the Constellation of Pisces into Aries during the month, and is now the evening Star, setting about seven o'clock at the beginning, and remaining visible until nearly nine at the end of the month. This Planet is now excellently adapted for transit observation by those who have the opportunity, passing the Meridian, between one and two o'clock in the afternoon. A transit instrument, of very moderate power, will shew her well. The time for each day may be found at pages 262 and 263 of the Nautical Almanac.

Mar. 1st.	R. A.	0 0 37	Dec. S. 1 12½	Diameter	10″·4.
31st.		2 17 10	N. 13 42½	,,	11″·2.

Illuminated portion of the disc of Venus 0·924.

Mars remains visible in the north-west sky during the evenings in March, continuing in the Constellation of Taurus.*

Mar. 1st.	R. A.	3 30 30	Dec. N. 20 24½	Diameter	5″·8.
31st.		4 46 39	- 23 48½	,,	5″·0.

Illuminated portion of the disc of Mars 0·910.

Jupiter continues in Virgo. This Planet rises about ten o'clock at the beginning of the month, and about half-past seven at the end. It is nearly at its greatest diameter, which it attains when in opposition next month. The Satellites can now be seen at a more favourable time: on the 19th instant no less than eight observations are to be made.

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* In the "Illustrated Almanac" it is stated that Mars will be in conjunction with Alpha Tauri on the 10th and 12th of this month: this is an error, the Star not being Aldebaran, but A^1 Tauri.

Mar. 1st.	R. A. 13 41 46	Dec. S.	8 57½	Diameter	39″·4
31st.	13 31 20	-	7 53	,,	41″·4

Saturn remains in the Constellation of Virgo, and rises about half-past seven at the beginning and twenty minutes past five at the end of the month. On the 23rd Saturn is in opposition, and best situated for observation, passing the Meridian at midnight.

Mar. 1st.	R. A. 12 18 6	Dec. N.	0 50½	Diameter	17″·4
31st.	12 9 49	-	1 46½	,,	17″·6

Dimensions of Ring—Outer Major Axis, 44″·0. Outer Minor Axis, $\left\{\begin{array}{l}\text{1st. } 3''{\cdot}9\\ \text{31st. } 3''.4\end{array}\right.$

Uranus continues in the Constellation of Taurus, and is visible during the evenings, setting about midnight at the end of the month.

Mar. 2nd.	R. A. 5 2 16	Dec. N.	22 53	Diameter	4″·0.
30th.	5 4 29	-	22 56	,,	3″·8.

Neptune is now passing out of view.

THE MINOR PLANETS.

The following are the Minor Planets which will be on, or within one hour of Right Ascension on either side of the Meridian, between 9 and 12 o'clock during the evenings of March. Their places are to be found in the Supplement to the Nautical Almanac for 1866.

	Magnitude.		Magnitude.
Juno	9·4	Bellona	9·3
Astræa	8·9	Isis	11·5
Victoria	10·7	Ariadne	11·0
Irene	8·7	Virginia	12·6
Eunomia	10·4	Europa	10·3
Thetis	10.9	Danaë	12·5
Phocea	12·3	Erato	12·6

ASTRONOMICAL OCCURRENCES FOR MARCH, 1863.

DATE.		Principal Occurrences.		Jupiter's Satellites.		Meridian Passage.
Sun	1	5 41 6 56	Occultation 5 Cancri (6) Reappearance of ditto	3d Sh. I. ,, Sh. E. ,, Tr. I. ,, Tr. E.	11 5 13 42 14 55 17 0	Moon. — 9 21·5
Mon	2	11 49 13 0	Occultation α Cancri (4) Reappearance of ditto	2nd Sh. E. ,, Tr. E. 1st Ec. D.	10 19 12 0 17 48 37	10 7·1
Tues	3			1st Sh. I. ,, Tr. I. ,, Sh. E. ,, Tr. E.	14 54 15 46 17 8 17 58	10 52·0
Wed	4			1st Ec. D. ,, Oc. R.	12 16 55 15 17	11 36·6
Thur	5	2 46 17 25 18 19	Full Moon Occultation, ϵ Leonis (5) Reappearance of ditto	1st Tr. I. ,, Sh. E. ,, Tr. E.	10 13 11 36 12 24	12 21·5
Frid	6	18 59	Conjunction, Moon and Saturn, 7° 44′ N.	1st Oc. R.	9 44	Procyon — 8 35·9
Sat	7	23 16	Mercury, greatest elongation, 27° 25′ W.	2nd Ec. D.	15 16 18	8 31·9
Sun	8	9 56	Conjunction, Moon and Jupiter, 5° 15′ N.	3d Sh. I. ,, Sh. E. ,, Tr. E.	15 3 17 40 18 23	8 28·0
Mon	9			2nd Sh. I. ,, Tr. I. ,, Sh. E. ,, Tr. E.	10 21 11 56 12 53 14 19	8 24·1
Tues	10	11 23 18 30 19 25	Conjunction, Mars and A^1 Tauri, 2m·7 E. Occultation, δ Scorpii (2½) Reappearance of ditto	1st Sh. I. ,, Tr. I.	16 48 17 32	8 20·1
Wed	11	13 2	Conjunction, Mars and A^1 Tauri, 0° 8′ S.	1st Ec. D. ,, Oc. R.	14 10 21 17 3	8 16·2
Thur	12	6 55 17 53 19 8	Moon's Last Quarter Occultation, B. A. C. 6088 Reappearance of do. (6)	3d Oc. R. 1st Sh. I. ,, Tr. I. ,, Sh. E. ,, Tr. E.	10 24 11 16 11 59 13 30 14 10	8 12·3
Frid	13	15 17 16 23	Occultation, ξ^2 Sagittarii (4) Reappearance of ditto	1st Oc. R.	11 29	8 8·3
Sat	14			2nd Ec. D.	17 51 7	8 4·4
Sun	15					8 0·5

DATE.		Principal Occurrences.		Jupiter's Satellites.		Meridian Passage.
Mon.	16			2nd Sh. I. ,, Tr. I. ,, Sh. E. ,, Tr. E.	12 55 14 14 15 27 16 37	Procyon — 7 56·5
Tues	17	3 16 8 0	Conjunction, Mars and υ^1 Tauri, 7m·4 E. Conjunction, Moon and Mercury, 7° 16′ S.			7 52·6
Wed	18			2nd Oc. R. 1st Ec. D.	10 43 16 3 52	7 48·7
Thur	19	2 37	New Moon	3d Ec. D. ,, Ec. R. ,, Oc. D. 1st Sh. I. ,, Tr. I. 3d Oc. R. 1st Sh. E. ,, Tr. E.	9 19 20 11 41 22 11 42 13 10 13 44 13 46 15 23 15 55	7 44·7
Fri.	20			1st Ec. D. ,, Oc. R.	10 32 16 13 14	7 40·8
Sat.	21	3 50	Conjunction, Moon and Venus, 4° 13′ S.	1st Sh. E. ,, Tr. E.	9 52 10 21	7 36·9
Sun	22	19 9	Saturn in opposition			7 33·0
Mon	23			2nd Sh. I. ,, Tr. I.	15 29 16 29	7 29·0
Tues	24	14 24	Conjunction, Moon and Mars, 1° 26′ N.			Moon. — 4 0·9
Wed	25	6 7	Conjunction of Moon and Uranus, 0° 48′ N.	2nd Ec. D. ,, Oc. R.	9 44 9 13 0	4 50·6
Thur	26	20 58	Moon's First Quarter	3d Ec. D. 1st Sh. I. ,, Tr. I. 3d Oc. R. 1st Sh. E. ,, Tr. E.	13 17 3 15 3 15 28 17 6 17 17 17 39	5 39·6
Fri.	27			1st Ec. D. ,, Oc. R.	12 25 52 14 58	6 27·7
Sat.	28			1st Sh. I. ,, Tr. I. ,, Sh. E. ,, Tr. E.	9 32 9 54 11 46 12 6	7 14·5
Sun	29	13 11 14 1	Occultation, A^1 Cancri(6) Reappearance of ditto	1st Oc. R.	9 24	8 0·2
Mon	30	11 44 12 53	Occultation, ω Leonis (6) Reappearance of ditto			8 45·1
Tues	31					9 29·6

EXPLANATION OF THE TABLES.

ASTRONOMICAL OCCURRENCES.

The **First** column contains the days of the week, the **Second** those of the month; the **Third**, the hour and minute, in Greenwich Mean Time, of the various occurrences which occupy the **Fourth** column. In this latter, the particulars of any event worthy of observation are given on each respective day: the *magnitude* of the stars is denoted by figures within brackets, thus—(6); in the case of conjunctions, (viz., "Conjunction of Moon and Uranus, 0° 14′ N."), the distance and direction of the *latter* object from the former are indicated—in this case Uranus is 0° 14′ North of the Moon. The **Fifth** and **Sixth** columns contain the visible phenomena of Jupiter's Satellites; here Tr. means *Transit;* Sh., *Transit of Shadow;* I., *Ingress;* E., *Egress;* Ec., *Eclipse;* Oc., *Occultation;* D., *Disappearance;* and R., *Reappearance.* The **Seventh** column contains the *Meridian Passage* of the Moon, or of some star or planet, happening between three o'clock in the afternoon and midnight.

It must be remembered that these Tables are not intended to do away with the necessity of referring to the *Nautical Almanac;* the fact of an event is merely pointed out, with the time of its occurrence, that it may not be missed—observers must seek for closer particulars in the pages of the Ephemeris.

ON THE "TIME" USED IN THE TABLES, &c.

The *Time* used in the Tables of Occurrences and elsewhere is **Greenwich Mean Time**, in which the day commences at Noon, and is continued through the twenty four hours until the following Noon, when another day begins. It has been suggested that the ordinary method of reckoning time would be more easily understood, but this would render necessary the constant use of the signs A. M. and P. M., and also involve the changing of many events from the days in which they are given in the Nautical Almanac into the following days. A little attention will soon overcome any difficulty that may arise, always remembering that from noon to midnight the day of the month and the hour of the day are the same in both methods, but from midnight to noon they differ. Thus, 13 hours on the 1st. of the month is 1 o'clock A. M. on the 2nd, 14 hours is 2 o'clock, &c.——In observations which take place an hour or two after midnight, little difficulty or confusion need be apprehended; it is in the morning that mistakes are most likely to occur: the Meridian Passage of Mercury, for instance, is given for the 28th of February at 22 hours 31 minutes, which, in the ordinary way of reckoning time, is a minute beyond half past 10, A. M., on the 1st of March.

It must be carefully borne in mind by those who are commencing their experience of Astronomical matters, that neither of the above methods of reckoning is *Sidereal Time:* this latter is the time shewn by the stars, and gains about four minutes a day on Mean Time, which is deduced from the Sun.

DOUBLE STARS, CLUSTERS, &c.

These Tables were originally arranged from Admiral Smyth's excellent work, the *Bedford Catalogue*, for use in the observing room, in order to prevent the destruction of that indispensable book by constantly turning over its leaves. The positions have been brought to the year 1865, to the nearest five seconds of time and thirty seconds of arc. The Stars are divided into classes, so that the objects best suited to the capacity of the telescope, the eye-piece, or the state of the atmosphere, may be readily selected. In the first column the name of the star is given at the left hand, with the magnitudes of the components, separated by the distance, underneath: this is followed by the angle of position. The second column contains the Right Ascension and Declination, (+ North, − South), and the third column is reserved, for the insertion of the date of observation, or any other remark.

No Stars closer than 1″·5, or wider apart than 180″, are included in this list, nor any less than the 11th magnitude.

NOTICES TO CORRESPONDENTS.

A Correspondent writes :—

"In the *Monthly Notices* for January 9th, (received February 14th), at page 90 Mr Joynson mentions that he has observed Mars with a power of 370 upon a 3½ inch aperture. In the Astronomical Register, page 19, you give the power as 170. Which is right? Is not 370 an excessive power for the planets upon an aperture of that size?"

From another Correspondent :

"It would be desirable that the *Mean Time* and the *second* of the occultation of Stars by the Moon should be given—I see it is only given in Astronomical Time and to the *minute*. The second is not given in the Nautical Almanac, why, I cannot think, for in many cases an occultation is a more exact observation than an eclipse of one of Jupiter's moons."

[An explanation as to the *time* used is given at page 46.—Ed.]

N. B.—In case of any information reaching us too late for insertion in our regular issue, we have made arrangements to forward it to our Subscribers on a separate slip by post.

A press of matter prevents us giving our usual list of Double Stars this month.

ERRATA in our last number.—Page 19, line 9 from bottom. for ν Geminorum, read U Geminorum.——Page 28, February 2nd, Occultation of 29 Cancri, for 18 44, read 13 44.——Page 30, Declination of θ Orionis, for + read –.

As a publication of this nature is peculiarly liable to errors, we trust our friends will kindly point out any they may detect; and we may add that we shall at all times be most happy to adopt, as far as practicable, any suggestions which may tend to render our pages more intelligible or useful.

The Astronomical Register is intended to appear at the commencement of each month: the Subscription, (for two copies of each number, including postage), is fixed at Two Shillings per Quarter, payable in advance, by postage stamps or otherwise. Single copies will be charged 4d.

Advertisements will be inserted at the rate of 6d. per line, for not less than five lines; or by special arrangement.

The pages of the Astronomical Register are open to all suitable communications: letters, articles for insertion, advertisements, &c., to be sent in not later than the 20th of the month.

The Astronomical Register may be obtained from Mr J. D. Potter, 31, Poultry, and at the principal Opticians; Subscriber's names will also be received by Mr. S. Gorton, Stamford Villa, Downs Road, Clapton, N. E., to whom all communications are to be addressed.

THE YEAR 1862.—We extract the following from the Summary of a Meteorological Journal kept by C. L. Prince, Esq., Uckfield: "The mean temperature of the year 1862 has been almost identical with the average of the last twenty years. In consequence of the heavy rain in October, the amount of rain for the year has been nearly 1-inch in excess. The winter of 1861-62 was very mild, and followed by a somewhat cheerless spring and summer, if we except the month of May. With the exception of October, the autumn was upon the whole, mild, fine and dry. The year closed with very mild, stormy and wet weather."

INSTRUMENTS, &c., FOR SALE.

Applications respecting prices and other particulars to be made to the Editor of this paper—if by letter, enclosing stamp for postage of answer.—These notices are inserted free of charge to Subscribers.

Astronomical Refractor, focal length 8 feet, aperture 5½ inches, by *Tulley*, Equatoreally mounted. [1]

Astronomical Refractor, focal length 4 feet, aperture 3⅜ inches, complete, on a Portable Universal Equatoreal Stand. [3]

Astronomical Refractor, focal length 5 feet, aperture 3¾ inches, unmounted. [4]

Equatoreal Mounting, (for Latitude 51 or 52), adapted for a telescope of 6 or 7 foot focus.—12 inch Circles, Driving apparatus, &c., all of the most approved construction. [5]

OPPOSITION OF JUPITER, APRIL, 1863.

Such of our Subscribers as desire it will be supplied with forms containing an ellipse—white on a black ground—of about one inch radius, for the purpose of taking drawings of the Planet Jupiter. These forms will be ready for delivery with our next number, and Gentlemen desirous of receiving them are requested to address a note to the Editor, on or before the 16th instant.

CONTENTS.

	Page
Lord Rosse on the Nebulæ	33
Meeting of the Royal Astronomical Society, February 13	36
Mr Baxendell on Variable Stars	39
The Royal Observatory, Edinburgh	40
Notes and Gleanings:	
New Planet, No. 77	41
Sun Spots	,,
Elements of Comet IV., 1862	,,
Obituary—M. Rumker; Professor Mitchel	,,
Positions of the Planets	42
Astronomical Occurrences for the Month	44
Explanation of the Tables	46
To Correspondents	47
Temperature of the year 1862	48
Instruments for Sale, &c.,	,,

LONDON: Private Press—Observatory, Downs Road, Clapton.

The Astronomical Register.

No. 4. APRIL. 1863.

LORD ROSSE ON THE NEBULÆ.

Continued from page 35.

Passing from the consideration of the construction and mounting of the six foot Telescope to the Observations made with that Instrument, we must bear in mind Lord Rosse's prefatory remarks, by which it appears that sometimes, when the Speculum in use happened to have been repolished, and was unaffected by the weather, the question of the resolvability of certain Nebulæ could be entertained, and the Nebulæ critically examined on that point; still, as a rule, the shape and details of the Nebulæ were more the objects of investigation, and the principal feature in a great number being found to consist in the spiral arrangement, the prevalence of this form was sedulously worked out.

On this subject he says:—"The question of resolvability, there "fore, I think, must remain to be taken up separately, when the "finest instrumental means are available, and when it may no longer "be necessary to subject the Specula to the wear and tear of con-"stant work."

The question of the nature of the Nuclei of many Nebulæ is also to some extent uncertain. "A Star may have been mistaken for a con-"densed Nucleus, or the reverse; and it is impossible to say which of "the two suppositions is the more probable."

In addition to Lord Rosse's own personal experiences, the Observations include those made by his assistants from time to time during his absence, and indeed, the whole of the Drawings and most of the work have been done by those gentlemen. It is right therefore to mention that the names of such Observers are Messrs. Johnstone

Stoney, Bindon Stoney, Hunter, and Mitchell, and Lord Rosse expresses the most perfect confidence in their results.

The Plates devoted to the Nebulæ are seven in number, and contain 43 sketches of the principal objects mentioned in the "Selected "Observations," which occupy 29 quarto pages, and also contain copies of numerous pencil drawings in the margin of the observing books, illustrating the remarks and measures. It is obviously impossible to give here anything like detail of these valuable results ; but it may be mentioned that the spiral convolutions present themselves repeatedly, and in some of the larger plates the figures are strangely contorted.

We may instance especially H 131, 857, 1,052, and 1,053, 1,061, 1,744, and 2,084, of which 131 and 1,744 are the largest and most remarkable. Much labour has been bestowed upon the well-known Dumb Bell Nebula (Messier 27), H 1,622, of which a plate is given, and measures of the numerous Stars detected in it; with a letter from Otto Struve, giving the results of his measurements of the Stars in the same Nebula for comparison.

Besides the spiral arrangement there are numerous oval, lenticular, and other bizarre forms, many of them divided by dark bands or streaks, and in the cluster in Hercules, H 1,968, there are three such dark lanes meeting in the centre, while the margin of the object is very irregular in outline, and has many far-stretching offshoots not generally seen.

Occasionally changes are suspected in Nebulæ when viewed from time to time, and Lord Rosse especially mentions H 1,905, which Herschel describes as two Nebulæ with their axes in a line. On April 11th, 1850, Mr. Johnstone Stoney remarks that the two Nebulæ are not in a line. April 17th, 1855, Mr. Mitchell remarks that the two Nebulæ are not in a line, but the axes are parallel, and gives a diagram. At the present time (June, 1861), Lord Rosse says they are neither in a line nor parallel, but inclined at an angle of 16 degrees.

We were in hopes that the Paper under notice would have contained a drawing of the Great Nebula in Orion, but we learn that although a portion of it has been drawn with great care, it will require further time to finish the work.

The Paper likewise contains a list of seventeen Nebulæ which were not found in their proper places, and although Lord Rosse hesitates to pronounce them "missing," it is desirable attention should be directed to their "whereabouts."

The Catalogue would have been easier of reference had it contained the numbers in Messier's List, as well as in Herschel's, in those cases where the Nebulæ were included by the French Astronomer, and it must be a matter of regret that the drawings are made black upon white, the reverse of Nature, instead of white upon a black ground, which would have given a more truthful idea of the Nebulæ ; but in all other respects the Paper forms a most valuable contribution to Sidereal Astronomy, and one of which the Royal Society and the Noble Observer may well be proud, showing, as it does, in his Lordship the combination of rare mechanical talent with the aptitude for employing it in the loftiest field of enquiry in which the mind of man has yet found scope for its extraordinary powers of research.

T. W. B.

ROYAL ASTRONOMICAL SOCIETY.

Fifth Meeting, March 13*th*, 1863.

The Astronomer Royal, *President*, in the chair.
Secretaries: Rev. C. Pritchard and Mr. Hodgson.

Seventy-four presents were announced, and among them Mr. Pritchard called attention to a new and simple system of arithmetic, published by Messrs. Bell and Daldy, of which he gave some explanation after the meeting.

A Memoir by Mr. Dunkin:—" On the Movement of the Solar System in Space," was then read by the author. He showed the extraordinary agreement of Astronomers as to the point in space towards which the Solar movement was directed. Sir William Herschel gave this at first as 260 degrees of right ascension, and 29 degrees 17 minutes north declination, near to the Star λ Hercules. Herschel's second determination was 245 degrees of right ascension, and 40 degrees 22 minutes north declination. Argelander gave 256 and 38, Struve, 261 and 37, the mean of these and other determinations being 259·9 degrees of right ascension and 34 degrees 36 minutes north declination. Mr. Airy had also recently arrived at a nearly similar result by using the proper motions of 113 of the Stars in Mr. Main's catalogue of 1,167 affected by proper motion, but in the present communication by Mr. Dunkin the whole of the 1,167 of Mr. Main's list had been used, for each of which long calculations had to be gone into ; the result being that the point indicated was 256 degrees of right ascension, and 39 degrees of north declination. In making some remarks upon this important paper. Mr. Airy explained that Herschel based his assumption upon the fact that in walking objects from which we are departing appear to lessen their distance from each other, while those we are approaching seem to widen out. He thus noticed Stars, streaming away as it were from one point and closing up in the opposite direction. His successors adopted this supposition, and endeavoured to improve his determination. This appeared to Mr. Airy very faulty, and he therefore followed the strictly independent method noticed in the memoir. One result is that it will not do to assume that those Stars which have a large proper motion are very near to us. The strange thing is that both methods give the same point in the heavens, yet with evidence in its favour which is demonstrably so small.

A communication from M. Goldschmidt on the Fringes of Light observed in the Total Solar Eclipse of Dec. 31, 1861.

On the "Visibility of Stars in the Pleiades to the unassisted eye:" by the Astronomer Royal. It was an old question as to the number of Stars which could be seen by the naked eye in this celebrated group.

> "Quæ septem dici, sex tamen esse solent."

A member of Mr. Airy's family was generally able to see seven, and on one particularly favourable evening (February 15th, this year), had counted no less than twelve.

Mr. Pritchard thought this was a subject well worthy of the attention of those Fellows of the Society who possessed good eyes, and wished to know if any members were able to discern the Satellites of Jupiter, on which point so much uncertainty prevailed.*

Mr. Hodgson asked the Astronomer Royal if he would be so kind as to furnish a diagram of the Stars seen on the particular occasion referred to in his paper.

On an "Equation for Calculating the Planetary Orbits:" by M. de Gasparis.

On the "Determination of the Longitude of Valentia in 1862 by Galvanic Signals:" by the Astronomer Royal. The longitude of the station at Valentia, as determined in 1844 by the repeated transmission of chronometers from Greenwich, had 81 hundredths of a second as its decimal, and by the recent operations with galvanic signals between the stations it came out 67 hundredths of the same second, a coincidence most surprising, and showing how much the former operations could be relied on. Mr. Airy observed that the most remarkable thing in the operation was the use of the Altazimuth for the determination of local time, which is better effected by that instrument than by any other in the absence of a meridian mark. The person using it, however, ought to practice with it first in order to discover if it has any fault.

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* The greatest elongation of the 4th Satellite from Jupiter is about 580″, and of the 3rd, 340″. The Star Alcor is about 700″ distant from ζ Ursæ Majoris, yet that Star is readily seen separate without optical assistance. The Stars ε and 5 Lyræ are about 200″ apart. Can anyone separate these with the naked eye? It would be desirable to learn with how low a power and with how small an aperture the Satellites of Jupiter can be seen. Is there a proved instance of anyone having seen them without a glass who has attempted it deliberately?—Ed.

A Paper from Mr. Hartnup on the Rating of Chronometers.

A letter from Mr. Pogson on the proceedings at the Madras Observatory. The new transit circle had been satisfactorily completed; the southern celestial survey was commenced on the first night of the year; the engraving of the Variable Star Atlas has also been commenced; the planet Mars had been duly observed for the investigation of parallax, both by the equatoreal and the transit circle.

A letter from M. Anwers to the Astronomer Royal on the subject of the Stellar Parallax.

A letter from Mr. Lassell, with drawings of Mars, taken by means of the large equatorial reflector at Malta.

Occultations of 15 Geminorum and α Cancri taken at Highbury by Mr. Burr.

Mr. De la Rue made a few remarks as to the accusation he had made against Dr. D'Orsan, of having copied portions of one of his lunar photographs and published them as his own; and read a letter on the subject from the Astronomer Royal to himself, in which it was explained that Mr. Airy had originally compared Dr. D'Orsan's photograph with one for which Mr. De la Rue was not responsible, and had thereby been induced to express an opinion quoted by Dr. D'Orsan in his letter to the *Athenæum*, that it was slightly better than Mr. de la Rue's, but that now having compared Dr. D'Orsan's portion of a 14-inch picture with a fine print 16 inches in diameter from Mr. De la Rue's negative, there could be no doubt of the superiority of the latter. Mr. De la Rue also exhibited two copies from the same negative, which by peculiar treatment showed a difference in the shadows, and hence it was clear that the slight alteration in illumination visible in the only two pictures Dr. D'Orsan had published, did not preclude their being taken from the same positive. Mr. De la Rue also confirmed the statement which has been made elsewhere that much of the doctor's introductory matter had been pirated from Dr. Chalmer's Astronomical Discourses, and said that he did not shrink from stating that it was a disgraceful theft on the part of Dr. D'Orsan, and that it was right in these cases to follow up and hunt to death the man who would commit such wilful frauds.

Mr. Hodgson exhibited several eye-pieces of novel construction and observed that he trusted they would form the basis of an interesting discussion, a "congress of eye-pieces," at the next meeting, for which he hoped gentlemen would come prepared.

STELLAR SPECTRA.—The Paper on this subject recently laid before the Royal Society by Mr. Huggins and Dr. Miller, and read at the Meeting of Feb. 26th, was rich in promise, and gave rise to a discussion, which the recent detailed examination of the Solar Spectrum, and the remarkable Observation of Kirchhoff upon the connexion of Fraunhofer's lines with the bright bands of artificial flames, and more recently still the observations of Donati and Rutherford upon the Stellar Spectra themselves, rendered doubly interesting. A drawing was exhibited, showing with considerable accuracy the principal lines seen on Sirius, Betelgeuse, and Aldebaran, and their position relatively to the Solar lines. Promising a detailed description of the apparatus at some future time, it was stated that it is attached to an achromatic telescope of eight inches aperture, mounted in the Observatory of Mr. Huggins, at Upper Tulse Hill: the object glass being by Alvan Clarke, of America, and the equatorial mounting by Cooke and Sons, of York, the telescope being carried very smoothly by clock motion. The position in the Stellar Spectrum corresponding to that of Fraunhofer's line D, from which the others are measured, has been obtained by coincidence with a soda line, the position of which in the apparatus was compared directly with the line D in the Solar Spectrum. During the past twelve months the Spectra of the Moon, Jupiter, and Mars, and between thirty and forty Stars, many of which were named, have been observed more or less carefully, and, judging from the result arrived at from the examination of Sirius, Betelgeuse and Aldebaran, all former work of the kind will be eclipsed in the delicacy and correctness of the Observations.—*Reader.*

[Mr. Huggin's Diagram and results were again referred to in Dr. Miller's Lecture on "Recent Discoveries in Spectrum Analysis," at the Royal Institution, on Friday evening, March 6th, and Photographs of the Spectra of Capella and Sirius obtained by him exhibited on the screen by the Electric Lamp.—ED. *Ast. Reg.*]

Our readers interested in Spectrum Observations may like to know that in the *Chemical News* of March 14th will be found an elaborate and valuable paper on Stellar Spectra, by Mr. Rutherford, of New York. The *Astronomische Nachrichten* of March 3rd contains a paper on the same subject, by Secchi. Both these Observers have been very successful, and amongst the Stars which have yielded results may be named Capella, Aldebaran, Arcturus, Sirius, Castor, Procyon and Regulus, together with the Moon, Mars, and Jupiter.

MR. BOND'S MEMOIR ON DONATI'S COMET.

The following account of this work, referred to by name at page 36 of our last number will be read with interest.

The work consists of 372 large quarto pages of text, illustrated by about 50 steel plate engravings of exquisite delicacy and beauty, with about 150 smaller and less important woodcuts and lithographs. The textual descriptions are comprised under the following fifteen sections :—(1) Figure and position of the tail, comprising the original notes of observations upon the principal tail between August 14, 1858, and Feb. 9, 1859, quoted with full references to the original authorities, and accompanied by remarks indicating the principal points of interest. This section is illustrated by 23 engravings on steel of the appearance of the Comet to the naked eye, and by eight woodcuts. (2) Observations upon the secondary tails, with three woodcuts, and engravings and charts of the naked-eye views. (3) Reduction of observations upon the figure and position of the tail. The results of the discussion are exhibited in a series of charts giving the normal outlines of the principal tail on 28 dates, between Sept. 16th and Oct. 17th inclusive, and the axis of the principal secondary tail for 17 dates. (4) Remarks on probable errors of observation upon the tail. (5) On the deflections of the tail, describing a peculiarity in its upper regions, during the first and part of the second week in October. Two plates of outlines and a woodcut accompany the text. (6) Columnar structure of the tail, relating to a remarkable feature faintly exhibited in the upper part of the tail. (7) Reduction of observations upon the secondary tails. The results of this discussion have been entered on the charts, with the outline of the principal tail. (8) Relates to the nucleus and envelopes. The original accounts descriptive of the telescopic appearance of the Comet are here quoted in the same form as in section 1. They are accompanied by twenty steel engravings. (9) On the outline of the head of the Comet. The discussion is illustrated by two plates, showing the normal outlines of the head between Sept. 3rd and Oct. 18th. (10) Is on the branches and central darkness of the tail. This section contains engravings of nine views of Comet III., 1860, for comparison. (11) Treats of the nucleus, describing it in detail, with particular reference to its size and changes of brightness. (12) The various phenomena of the envelopes, their velocity of ascent, the dark and light spots on their surface, and the questions of their rotation or oscillation are considered in this section, which is illustrated by a lithographic plate of 138 views. The section concludes with a notice of the envelope formation in Comet III., 1860, and in the great Comet of 1861, accompanied by a steel engraving of the former. (13) Contains an account of the outer faint veil, with a reference to a similar peculiarity in the Comet of 1860. (14) Deals with the direction of the axis of the tail, and (15) Contains a concluding summary. The foregoing epitome will convey some general notion of the scope and magnitude of the work. 87 authors are quoted from, of which 31 are English, 18 German, and only three French, and the entire volume does infinite credit to the untiring abilities of its distinguished editor-in-chief. A more magnificent contribution to the scientific literature of any country has never been made, and it will long remain a brilliant monument of the skill, enterprise, and genius of the professional astronomers of the Federal States of America.—Abridged from the *English Churchman.*

VARIABLE STARS.—At the Meeting of the Literary and Philosophical Society of Manchester, on the 5th of March, Mr. Baxendell drew attention to the attempt which is now being made to organise an Association for the Systematic Observation of Variable Stars, and presented to the Section a Chart of the vicinity of the Variable Star, R *Canis Minoris*, neatly executed by Mr. George Knott, F.R.A.S. of Woodcroft Observatory, Cuckfield, Sussex. This chart extends over one square degree: the central portion of half a degree square includes all the Stars which are visible with a 7-inch object glass, and the outer portion all Argelander's Stars to the 9·5 magnitude. A list of twelve comparison stars is given. the magnitudes of which have been photometrically determined by the method of limiting apertures. In reference to the objects of the Association, Mr. Baxendell remarked that the importance of a careful study of the phenomena of Variable Stars will be apparent when it is considered that all the so-called fixed Stars—our own Sun included—are supposed to have a general similarity of constitution; and as several eminent astronomers have doubted whether the emission of light from the Sun is absolutely constant, it is not improbable that an extended knowledge of the phenomena of variable Stars may ultimately assist us in obtaining a more intimate acquaintance with the constitution and phenomena of the great luminary of our own system, and lead to the detection of changes at present no trecognised, but which in their influence upon the Earth may have an important bearing upon many questions of considerable interest in magnetical and meteorological science, and also upon the economy of the various forms of animal and vegetable life. The recent results of spectral analysis tend to show that the light of the Sun has a general resemblance to that of the class of Stars to which nearly all the known variables belong, and thus give additional weight to the probability that it may also be slightly variable.

We are glad to see the study of Variable Stars so energetically taken up in England since the departure of Mr. Pogson to Madras, and hope that the proposal of Mr. Baxendell (in conjunction with Mr. Knott) to organise an association for observing these objects on a well arranged system, will meet with a ready response. Mr. Baxendell has just been elected President of the Literary and Philosophical Society of Manchester.

NOTES AND GLEANINGS.

Comet I, 1863.—The following elements of this comet have been computed by M. Engelmann of Leipzig :—

P. P. = 1863, Feb. 3·526. B. M. T.
π = $191^\circ 22'$
☊ = 116 55
ι = 85 22
Log. q. = 9·90023

Heliocentric motion, direct.

This Comet was discovered by M. Respighi at Bologna on Nov. 28th, 1862, and independently by Bruhns two days later.

Sirius.—M. Goldschmidt of Paris announces to the Academy his discovery of five small stars, companions to Sirius, in addition to the one found by Alvan Clark in America. They lie at distances varying from $15''$ to $1'$, and were detected with a telescope of only 46 lines, ($3^5/_8$ English inches,) aperture. It is not a little remarkable that these stars should not have been noticed before.—*Paris 'Mondes.'*

The Nebula of Orion.—We understand that Professor Bond, of Cambridge, F.S.A., is preparing for publication a lengthy memoir on this magnificent object, embodying the results of fourteen years observations, latterly made with Alvan Clark's large object glass of 18½ inches aperture. The spiral structure of the nebula, which has lately been distinctly visible in this glass, and the supposed change of its appearance within the last few years, will doubtless be found amongst the topics treated of.

The Dublin University Observatory.—At the recent installation of the Earl of Rosse as Chancellor of this University, it was announced that Sir James South of Kensington had presented his 12-inch object glass to the Observatory.

A Large Reflector is stated to be in contemplation for the colony of Victoria, N.S.W. The provincial government will be at the expense, and it is proposed that the instrument shall be equal in size to the well known reflector of Lord Rosse, in order that it may be used in the scrutiny of clusters and nebulæ.

The Nautical Almanac.—Last year there were sold 18,845 copies of this work. The total profits arising from the sale of Admiralty publications, including this, amounted to £4277.

The Cambridge Observatory.—The sum of £2000 has been transferred to the Astronomer Royal by Miss Sheepshanks, in trust, to be employed for the benefit of this Observatory, with special reference to the purchase of one or more large instruments, or classes of instruments, for the use of the Observatory.

The Glasgow Observatory is about to receive an important instrumental reinforcement in the late Sir W. Keith Murray's 9-inch Cooke refractor, purchased by some worthy citizens of Glasgow. A special building in connexion with the observatory is now being prepared for its reception.

The Railway through Greenwich Park.—The Astronomer Royal has pointed out to the Admiralty that the proposed passing of the London Chatham and Dover Railway within 1000 feet of Greenwich Observatory would have have an injurious effect on the observations. It was stated in answer that experiments would be made as to the effect of the near passage of trains upon astronomical instruments; and it was added that while the railway ought not to be unnecessarily interfered with, no damage could be allowed to result to an institution so valuable as Greenwich Observatory.

A Scientific Balloon Ascent from the Crystal Palace, was proposed by Mr Glaisher for the 26th ult. Dr Lee, Mr Coxwell, Mr Negretti, &c., joined him early on the ground, but the ascent had to be postponed on account of the violence of the wind.

THE PLANETS FOR APRIL.

Mercury rises about a quarter past five at the beginning of the month : it is not favourably situated for observation, being far from us, and passing its superior conjunction with the Sun on the 20th. It is in Pisces at the beginning, and passes into Taurus during the month.

April 1st.	R. A.	23 38 43	Dec. S.	4 52½	Diameter	5″·2.
30th.		3 11 51	- N.	19 7	,,	5″·2.

Venus continues to be the evening Star, setting about nine o'clock at the beginning, and about half-past ten at the end of the month. Although a conspicuous object in the western sky it is not yet near its greatest brilliance. It is now increasing in size, and losing its circular phase.

April 1st.	R. A.	2 21 52	Dec. N.	14 9½	Diameter	11″·4.
30th.		4 44 53	- .	23 44	,,	12″·6.

Illuminated portion of the disc of Venus 0·860.

Mars is now rapidly decreasing in brightness. It passes from the Constellation of Taurus into that of Gemini during the month, setting about midnight in the north-west.

April 1st.	R. A.	4 49 17	Dec. N.	23 53	Diameter	4″·9.
30th.		6 6 48	-	24 51	,,	4″·4.

Illuminated portion of the disc of Mars 0·927.

Jupiter remains in the Constellation of Virgo, and arrives at its greatest brightness during the month, being in opposition on the 12th, or in a direct line with the Earth and the Sun. The Occultation of the first Satellite on that day proves this in a very clear manner : the Satellite disappears behind Jupiter, and reappears from the disc of the Planet without being eclipsed by the shadow, proving the shadow to be projected in a direct line from us. On the 13th the same

Satellite and its shadow come on to the disc of Jupiter within one minute of each other (at 7 h. 48 m.), showing the small amount by which the Earth has departed from the direct line in one day.

April 1st.	R. A.	13 30 53	Dec. S.	7 50	Diameter 41″·4
30th.		13 17 19	-	6 30½	,, 41″·2

Saturn continues splendidly visible during the night, passing the Meridian about half-past eleven at the beginning, and about half-past nine at the end of the month. The ring is again decreasing in breadth. Some Observations lately made by Mr. Wray seem to hint that the crape ring is of a greater thickness than the bright rings. This should be carefully noticed by all who possess powerful telescopes. The edge of the shadow of the ring on the Planet has lately been seen serrated. This should be looked for.

April 1st.	R. A.	12 9 32	Dec. N.	1 48½	Diameter 17″·6
30th.		12 2 28	-	2 31½	,, 17″·2

Dimensions of Ring—Outer Major Axis, 43″·5. Outer Minor Axis, 2″8.

Uranus continues visible in the Constellation of Taurus.

April 3rd.	R. A.	5 5 1	Dec. N.	22 56½	Diameter 3″·8.
27th.		5 9 14	-	23 2	

THE MINOR PLANETS.

The following are the Minor Planets which will be on, or within one hour of Right Ascension on either side of the Meridian, between 9 and 12 o'clock during the evenings of April. Their places are to be found in the Supplement to the Nautical Almanac for 1866.

	Magnitude.		Magnitude.
Juno	9·3	Harmonia	9·5
Astræa	9·2	Isis	11·4
Victoria	11·0	Ariadne	11·4
Irene	8·9	Olympia	12·0
Eunomia	10·3	Danaë	12·7
Physche	10.8	Erato	12·5
Bellona	9·7		

ASTRONOMICAL OCCURRENCES FOR APRIL, 1863.

DATE.		Principal Occurrences.		Jupiter's Satellites.		Meridian Passage.
		h. m.			h. m. s.	h. m.
Wed	1	6 28 7 36 12 7	Occultation 55 Leonis (6) Reappearance of ditto Near approach of Moon to p^2 Leonis (6)	2nd Ec. D. ;, Oc. R.	12 19 39 15 15	Moon. — 10 14·4
Thur	2	11 25 12 4 23 20	Occultation of B.A.C. 4006 Reappearance of ditto (6) Conjunction of Moon and Saturn, 7° 50′ N.	1st Sh. I. ,, Tr. I. 3d Ec. D.	16 57 17 12 17 15 3	11 0·3
Frid	3	16 9	Full Moon	2nd Tr. I. ,, Sh. E. ,, Tr. E. 1st Ec. D. ,, Oc. R.	7 50 9 52 10 14 14 19 34 16 42	11 48·1
Sat	4	12 25	Conjunction of Moon and Jupiter, 5° 24′ N.	1st Sh. I. ,, Tr. I. ,, Sh. E. ., Tr. E.	11 26 11 38 13 39 13 50	Saturn. — 11 17·5
Sun	5			1st Ec. D. ,, Oc. R.	8 47 59 11 8	11 13·3
Mon	6			3d Tr. I. 1st Sh. E. ,, Tr. E. 3d Sh. E. ,, Tr. E.	7 42 8 8 8 16 9 28 9 50	11 9·1
Tues	7	4 41	Conjunction of Uranus and Mars, 1° 20′ N.			11 4·9
Wed	8			2nd Ec. D.	14 55 25	11 0·7
Thur	9					10 56·5
Frid	10	13 23	Moon's Last Quarter	2nd Sh. I. ,, Tr. I. ,, Sh. E. ,, Tr. E. 1st Ec. D.	9 55 10 3 12 26 12 28 16 13 22	10 52·2
Sat	11	15 7 15 8 16 12	Occultation, reappearance of τ^1 Capricorni (6) Occult. τ^2 Capricorni (5) Reappearance of ditto	1st Sh. I. ,, Tr. I. ,, Sh. E. ,, Tr. E.	13 20 13 22 15 33 15 34	10 48·1
Sun	12	9 41	Jupiter in opposition	1st Oc. D. ,, Oc. R.	10 40 12 52	10 43·9
Mon	13			1st Tr. I. ,, Sh. I. ,, Tr. E. ,, Sh. E. 3d Sh. I. ,, Tr. I. ,, Tr. E. ,, Sh. E.	7 48 7 49 10 0 10 2 10 54 10 59 13 9 13 27	10 39·7
Tues	14			1st Ec. R.	7 18 39	10 35·6
Wed	15					10 31·4

DATE.		Principal Occurrences.		Jupiter's Satellites.		Meridian Passage.
		h. m.			h. m. s.	h. m.
Thur	16					Saturn. — 10 27·2
Fri.	17	12 17 15 5	Conjunction of Moon and Mercury, 4° 41′ S. New Moon	2nd Tr. I. ,, Sh. I. ,, Tr. E. ,, Sh. E.	12 16 12 29 14 41 14 59	10 23·0
Sat.	18			1st Tr. I. ,, Sh. I.	15 6 15 14	10 18·8
Sun	19			2nd Ec. R. 1st Oc. D. ,, Ec. R.	9 14 7 12 24 14 43 59	10 14·7
Mon	20	6 29 6 55	Superior Conjunction of Mercury Conjunction of Moon and Venus, 0° 24′ N.	1st Tr. I. ,, Sh. I. ,, Tr. E. ,, Sh. E. 3d Tr. I. ,, Sh. I. ,, Tr. E.	9 32 9 43 11 44 11 56 14 14 14 53 16 28	10 10·5
Tues	21	12 19 16 16	Conjunction, Venus and A^1 Tauri, 5m·1 W.. Conjunction of Moon and Uranus, 1° 4′ N.	1st Ec. R.	9 12 29	10 6·3
Wed	22	10 1	Conjunction, Moon and Mars, 3° 10′ N.			10 2·2
Thur	23					Moon. — 4 20·3
Fri.	24	12 5 18 20	Conjunction of Venus and υ^1 Tauri, 1m·9 E. Ditto, 0° 4′ S.	3d Ec. R. 2nd Tr. I. ,, Sh. I.	7 28 20 14 29 15 3	5 7·6
Sat.	25	16 8	Moon's First Quarter			5 53·4
Sun	26	9 46 10 54	Occultation, κ Cancri (5) Reappearance of ditto	2nd Oc. D. ,, Ec. R. 1st Oc. D.	8 44 11 50 12 14 8	6 38·1
Mon	27			1st Tr. I. ,, Sh. I. ,, Tr. E. ,, Sh. E.	11 17 11 37 13 29 13 51	7 22·0
Tues	28			1st Oc. D. ,, Ec. R.	8 34 11 6 27	8 6·0
Wed	29	10 29 11 28	Occultation, ε Leonis (5) Reappearance of ditto	1st Tr. E. ,, Sh. E.	7 55 8 19	8 50.8
Thur	30	5 40	Conjunction, Moon and Saturn, 7° 56′ N.			9 37·4

TABLE OF NEBULÆ.

Right Ascension, Ten Hours.

NAME OF NEBULA.	Right Ascension and Declination.	Remarks.
4 Hersc. I. Sextantis... A faint and wispy pair of nebulæ, one following the other on the same parallel.	10 7 15 + 4 7½	
27 Hersc. IV. Hydræ... A wonderful planetary nebula, so bright and well defined, that with a low power it very much resembles Uranus as viewed with a high one.	10 18 10 −17 58	
86 Hersc. I. Leonis Min. A rather dim nebula, but with indications of a stellar nucleus.	10 19 40 +29 11	
60 Hersc. IV. Ursæ Maj. A bright planetary nebula, small but well seen, but not so interesting an object as 27 Hersc. IV. Hydræ.	10 30 20 +54 12½	
95 M. Leonis .... A dim nebula with little beauty.	10 36 50 +12 24½	
18 Hersc. I. Leonis...... Very interesting pair of nebulæ, the brightening towards their respective centres being strongly marked. The preceding one is the larger.	10 41 10 +13 20	
362 Hersc. II. Leonis Min. A dim little thing.	10 43 50 +28 41	
87 Hersc. I. Leonis Min. Faint and dim.	10 53 0 +29 42	
88 Hersc. I. Leonis Min. Brighter than the last, with signs of condensation.	10 55 50 +28 42	
13 Hersc. I. Leonis...... A moderately bright nebula, trending N.P., and S.F. The effect of a stellar nucleus becomes particularly apparent to an averted eye.	10 58 50 + 0 41½	

REMARKS ON THE FOREGOING TABLE OF NEBULÆ.

The list of Nebulæ subjoined comprises all those contained in "Smyth's Celestial Cycle," which are situated between 10 and 11 hours of R.A. "Hersc." signifies that the object to which it is attached is taken from one of Sir William Herschel's Catalogues; "M." that it is extracted from that of Messier. The remarks appended describe the aspect of these objects as viewed in a Telescope of 4·2 inches aperture with a power of 7·4.

In the vast majority of instances a low power is essential for the observation of Nebulæ, 30 or 40 being ample with a Telescope of three inches aperture. A curious exception to this rule, however, obtains with some of the Planetary Nebulæ; as, in the case of the second object in the list, 27 Hersc. IV. Hydræ, the writer of these lines has even employed a power of 255 without interfering with the distinctness of the remarkable disc which it presents. In viewing Nebulæ, *light is everything*, and an inferior Telescope, of large aperture, will consequently show them better than the most perfect one with a much smaller object-glass.

It is necessary to caution the Amateur who may wish to observe Nebulæ, that the greatest care must be taken to avoid stimulating the eye by the employment of artificial light. In order to read the circles of his instrument or his list of objects, a lamp glazed with deep red glass and emitting very little even of that coloured light should be used. In the absence of this arrangement the writer has successfully employed a double thickness of crimson silk to cover the glass of his lantern. The safest rule is however to remain in total darkness for some few minutes before looking at a Nebulæ at all.

W. N.

THE LUNAR SURFACE.—Mr. W. R. Birt whose indefatigable examination of the Moon has materially added to our knowledge of the surface of that luminary, is about to receive from the Royal Society an accession to his means of observation, in a Telescope of four inches aperture, now preparing for him by Messrs. Smith & Beck. Mr. Birt intends visiting Dr. Lee's Observatory at Hartwell about the 24th instant, for the purpose of continuing his long series of observations of the region about Plato, of which he is constructing nineteen maps—each referable to the twentieth part of the period of illumination.

AURORA BOREALIS.—A brilliant display of this phenomenon was seen by Mr. E. J. Lowe, of Beeston, on the evening of March 21st. Shortly after eight o'clock it reached an altitude of 43 degrees. At 8·33 a meteor at first equal to a fourth, but increasing in size to a star of the first magnitude, passed from ζ Persei to α Arietis, becoming remarkably red when passing through the Aurora.

CELESTIAL PHOTOGRAPHY.—A Lecture on this interesting subject was delivered by Mr T. W. Burr, F.R.A.S., at the Islington Literary and Scientific Society on the 21st ult., of which we propose to give an abstract in our next number.

THE PLANET JUPITER.—With this number we present our subscribers with a drawing of Jupiter, taken from an observation made on the 21st of last month. We also append one of the forms prepared for taking drawings of the planet, copies of which we shall be happy to forward to any of our subscribers who may be willing to co-operate in producing a systematic series of views, in order to register the principal changes of form and position of the belts.

NOTICES TO CORRESPONDENTS.

As a publication of this nature is peculiarly liable to errors, we trust our friends will kindly point out any they may detect; and we may add that we shall at all times be most happy to adopt, as far as practicable, any suggestions which may tend to render our pages more intelligible or useful.

Through the kindness of the Astronomer Royal we hope in our next number to present our readers with a copy of the chart of the *Pleiades*, prepared by him for the "Monthly Notices."

INSTRUMENTS, &c., FOR SALE.

Applications respecting prices and other particulars to be made to the Editor of this paper—if by letter, enclosing stamp for postage of answer.—These notices are inserted free of charge to Subscribers.

Astronomical Refractor, focal length 4 feet, aperture 3⅜ inches, complete, on a Portable Universal Equatoreal Stand. [**3**]

Equatoreal Mounting, (for Latitude 51 or 52), adapted for a telescope of 6 or 7 foot focus.—12 inch Circles, Driving apparatus, &c., all of the most approved construction. [**5**]

CONTENTS.

Page
Lord Rosse on the Nebulæ *(continued)* ... 49
Meeting of the Royal Astronomical Society, March 13 ... 51
Stellar Spectra ... 54
Mr Bond's Memoir on Donati's Comet ... 55
Variable Stars ... 56

Notes and Gleanings :

Comet I, 1863——Sirius——Nebula of Orion——Dublin University Observatory——Reflector for New South Wales——The Nautical Almanac——Cambridge Observatory——Glasgow Observatory——The Railway through Greenwich Park——Scientific Balloon Ascent ... 57
Positions of the Planets ... 58
Astronomical Occurrences for the Month ... 60
Table of Nebulæ ... 62
Remarks on ditto ... 63
The Lunar Surface ... ,,
Aurora Borealis ... ,,
Celestial Photography ... 64
The Planet Jupiter ... ,,
Notices to Correspondents ... ,,
Instruments for Sale, &c., ... ,,

LONDON: Private Press—Observatory, Downs Road, Clapton.

The Astronomical Register.

No. 5. MAY. 1863.

CELESTIAL PHOTOGRAPHY.

The following is the substance of Mr. T. W. Burr's Lecture on this subject, referred to in our last number. After some introductory observations, the Lecturer said he would proceed in the first instance to trace the application of Photography to Astronomy in the historical point of view, and he would then give an account of the various ingenious methods and contrivances whereby such successful results had been obtained by the celestial photographers of the present day. The Moon was the first heavenly body attempted to be taken by means of photography, and the earliest results in this direction that he was aware of, were some Daguerreotypes taken by Mr. Bond, of the Cambridge Observatory (United States), assisted by Messrs. Whipple and Black, and sent among other American curiosities to the Great Exhibition of 1851, when they were also shewn at one of the meetings of the Royal Astronomical Society. These pictures were obtained by means of a refracting telescope of 15 inches aperture, probably as fine an instrument of its class as existed. The pictures were three inches in diameter, and very perfect in detail. Mr. Archer having introduced the use of collodion into the photographic art in that year, Mr. De la Rue applied it to celestial photography in 1852, and by means of his large reflecting telescope, of 13 inches aperture, produced photographs of the Moon one and a half inches in diameter, which were exhibited to the Royal Astronomical Society in 1853. At that time Mr. De la Rue had no machinery for driving his telescope, and was assisted by Mr. Thornthwaite in making it follow the course of the Moon by hand. In consequence of the difficulties to be surmounted, Mr. De la Rue stopped his photographic operations, until in 1857 he completed a driving clock. In 1853 Professor Phillips, then residing at York, succeeded in taking photographs of our satellite with an 11 foot refractor, of six and a quarter inches aperture. The process was very slow, and although he was provided with a driving clock, the pictures were not sufficiently sharp. In 1854 Mr. Hartnup, of Liverpool, assisted by Mr. Crookes, produced some very good pictures of the Moon, with an eight inch aperture telescope, and since that time Professor Secchi, of Rome, working with a telescope of nine inches aperture, Mr. Fry, using Mr. Howell's telescope at Brighton, of nearly seven inches aperture, and Mr. Huggins, of Tulse Hill, with an instrument of 10 feet in length, and eight inches aperture, have prosecuted their labours in that direction. The latter works with a little camera screwed into the eye end of the telescope, with a back of the ordinary description, containing the collodion plate, and with a part of the draw tube graduated to tenths of an inch for the purpose of noting the exact focus. Mr. Fry uses a graduated board and screw adjustment for the same purpose. All the gentlemen using refracting telescopes which were only corrected for perfect achromatic vision, experienced great difficulty in consequence of the difference between the position of the actinic and visual foci, but reflecting telescopes were not open to that objection. In 1857 Mr. Bond sent to this country a collodion photograph of the double Star Mizar, in the Great Bear's tail, of very sensible magnitude, and so sharp that, by the application of a delicate measuring apparatus, the distance between the two components of the Star and their relative position could be accurately ascertained. The same gentleman also exhibited a photograph of the Star Vega, crossing the field of his transit instrument. The track of the Star left on the picture a singularly blurred line, the unevenness of which was attributable to atmospheric causes. Mr. Bond said he had in 1851 obtained a daguerreotype of the Stars Castor and Vega.

The preceding were the principal attempts that had been made to photograph celestial bodies down to a recent time; and, in giving an account of the methods now in use, the Lecturer said he should be principally indebted to the information he had obtained from Mr. De la Rue, either from personal communications, or from his report to the British Association, and other papers. It would be found that the great difficulty to be surmounted in taking lunar photographs, was to make the telescope follow with sufficient accuracy the Moon's course, which was more complicated than that of any of the other heavenly bodies. For this purpose astronomers used a telescope with its axis tilted parallel to that of the earth, called an Equatoreal, which followed the course of the Moon by one motion instead of the two required by the common altitude and azimuth mounting of a telescope. The instrument was driven by clockwork, its speed being regulated and adjusted by a contrivance similar to the governor of a steam engine, whereby equable motion at the desired rate was obtained. The apparent motion of the Moon was not only slower than that of the Sun and Stars, but its change in declination was also much more rapid—that of the Sun being only about 5′ in the twenty four hours, whilst that of the Moon was often 10° in that time, and as this is not corrected by the driving clock, the best plan to avoid indistinctness in the picture, is to endeavour to accelerate the action of the chemicals employed. Mr. De la Rue used a negative collodion containing iodide of cadmium, avoiding acetic acid and alcohol in the bath, which he made as neutral as possible, and developed with pyrogallic and acetic acids. By that means he obtained pictures of the full Moon, either instantaneously or in five seconds, and of the half and other phases in from 30 to 60 seconds. That gentleman sometimes exposed his plate in the usual way, in the situation of the eye-piece, and sometimes replaced the small mirror of his Newtonian reflector with the collodion plate, but had not obtained much greater quickness of action by so doing, as the actinic rays appeared not to be absorbed by the second mirror in the same proportion as the visual rays. Mr. De la Rue had the great advantage of having the actinic and visual rays brought to the same focus, as there is no dispersion by a mirror, and he could therefore obtain his focus most accurately by using a magnifier. The great disadvantage of a refracting telescope was, that the actinic and visual foci did not coincide, the former being always behind the latter, and hence the proper position of the plate could only be found by experience. In some experiments with his own telescope, of 3⅜ths inches aperture, and 4 ft. 4 in. focal length, Mr. Burr found the actinic focus was from ⅛th to ¼ in. behind the visual focus. In Messrs. Huggins's, Phillips's, and Fry's telescopes it was ¾ of an inch ; in Mr. Hartnup's eight tenths of an inch ; and in Mr. Bond's 22 foot focus telescope it was 1¼ inch behind the visual focus. The negatives were very small, as even those obtained by means of the largest telescopes were only three inches in diameter, whilst those of Mr. De la Rue were about 1¼ inch, and Messrs. Fry's and Huggin's somewhat less ; but Mr. De la Rue had succeeded subsequently in enlarging his to various sizes up to three feet in diameter. In taking the picture with a Newtonian telescope, the mouth was covered over when fixing the sensitive plate in its proper position, then uncovered until the exposure was sufficient ; but where only one mirror was used, a screen was placed between it and the plate. Mr. De la Rue and Mr. Fry, by taking advantage of the librations of the Moon, had produced some beautiful stereoscopic pictures ; and Mr. George Jackson had reduced some lunar photographs for inspection in the microscope, wherein the detail was very perfect. Lunar photographs were of the greatest value to astronomers, who were thereby acquiring a more intimate knowledge of the details of the Moon's surface; and, with respect to those dark portions of it usually called "seas," but which were known to be depressed plains, Mr. De la Rue was led to suppose they contained a dense atmosphere of small height accumulated at those spots. Such pictures would be of the greatest assistance in making maps of the Moon, by accurately defining the positions of the mountains, leaving the minute detail to be filled in by hand-drawing, until pictures on a larger scale could be obtained. This part of the Lecture was illustrated by numerous lunar photographs, including one of Mr. De la Rue's earliest pictures; three of the lunar micro-photographs; several of the finest stereographic pictures; the small and large (18-inch) series of twelve phases lately published by Messrs. Smith & Beek from Mr. De la Rue's negatives, and a selection from the latter photographed on glass, and by means of the lime light lantern, magnified on a disk to nine feet in diameter, which amplification they sustained admirably.

[*To be continued.*]

ROYAL ASTRONOMICAL SOCIETY.

Sixth Meeting, April 10th, 1863.

The Astronomer Royal, *President*, in the chair.
Secretaries: Rev. C. Pritchard and Mr. Hodgson.

J. W. Harris, Esq., M.R.C.S., and
Lieut. Col. P. Stewart, R.E.,
were balloted for, and duly elected fellows of the Society.

"On the Determination of the Sun's mean Parallax"—by Mr. Stone. Doubts having been cast on the usually received distance of the Sun by M. Leverrier, it was desirable to take advantage of the opposition of Mars for a fresh determination. Observations made at Greenwich had been compared with others made at Williamstown, Victoria, from which, by twenty-two independent determinations between August 25th and November 12th, 1862, Mr. Stone deduced 8″·977 as the value of the Sun's Parallax.

The Astronomer Royal stated, that Mr. Stone's result having been given he would now communicate the value which M. Wiennecke from observations made at Pulkowa compared with others at the Cape, had arrived at, viz. 8″·96, while M. Leverrier considered that it ought to be 8″·95. The accepted value of the Sun's Parallax had hitherto been 8″·57. Mr. Airy further remarked that the agreement of these results might almost be called "absurd,"—in fact, it was too good a great deal. However, we might safely conclude that the Sun was not so far off by three or four millions of miles as he had had the credit of being, and might place great confidence in the correctness of the new value. The results were

Determination of	Leverrier	8″·95.
,,	Wiennecke	8″·96.
,,	Stone	8″.97.

"On a Close Companion to Procyon"—discovered with the 7½-inch. refractor by Cooke, at the Observatory of J. G. Barclay, Esq., Leyton. This small Star, of the 10·5 magnitude, precedes Procyon by three or four seconds of time, and is to the north of the large Star. Mr. Romberg had made observations of this Star with the 10-inch refractor now in Mr. Barclay's Observatory, by means of a ring micrometer. The paper also contained measures of γ^2 Andromedæ—the estimated distance of which was 0″·6.

"Occultation of B.A.C. 4006," observed at Maresfield by Capt. Noble.

On "the Appearance of the Dusky Ring of Saturn," by Mr. Carpenter. The dark space between the ring and ball has lately appeared contracted, owing, apparently, to an increase of brightness of the dusky ring.

On the "Stellar Spectra." The Astronomer Royal gave an oral explanation of a Diagram of the Spectra of a number of Stars, and also of the apparatus employed in the investigation. A fine Prism by "Chance," of Birmingham, measuring two inches on each side, was mounted in a tube attached to the Great Equatoreal, beyond the point where the rays from the Star crossed, and the dispersed rays were then further separated by two lenses through which they passed before reaching the eye and micrometer. These lenses were not achromatic, but of strongly dispersive flint glass. A cylindrical lens was not used to widen the band of light, but the same effect was obtained by an inclination of the prism. An ingenious contrivance of an eye-piece with a wire was employed, by which the Stellar Spectrum was brought upon the same spot the Solar Spectrum had occupied. The Astronomer Royal said that the general results of the observations made by Mr. Carpenter were shown in the drawing exhibited to the meeting. In the Stellar Spectra two or three strong broad lines generally occur, vastly larger than those caused by the Sun, from which indeed they are characteristically different. Many of the Stars have a strong line, agreeing with Faunhofer's line F—an iron line; and thus it may be concluded that iron is present in the atmosphere of all these Stars.* The Sodium line D occurred in two Spectra, and a line nearly but not quite coinciding with G in many. Of all the Stars examined, α Orionis most nearly resembled our Sun; but it would seem that most of the Stars were rather in a rude state as compared with that luminary. The Astronomer Royal concluded by stating that as it was a subject just now exciting great attention, he had thought it desirable to give this early account of what was doing at Greenwich.

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* Sirius, Castor, Procyon, γ Geminorum, β Aurigæ, Regulus, θ Aurigæ, Spica, γ Virginis, and Capella.

Admiral Manners, who occupied the Chair while the President was speaking, said that he was sure the meeting would join in thanks for the communication just made. Although many private observers were giving attention to the subject, it was to Greenwich Observatory that all looked as a directing star: nothing could escape it—in fact it seized on anything that was in the remotest way connected with Astronomy.

Mr. Huggins who had recently, in association with Professor W. A. Miller, read a paper at the Royal Society on this subject, wished to ask whether the lines shewn in the diagram were the whole of the lines seen. He considered his method of observation was calculated to give more perfect results than that employed at Greenwich. The Spectrum of Capella, for instance, which in the Astronomer Royal's drawing has only two bars, he had observed to be full of fine lines, so fine and so many as apparently to defy accurate delineation. This Star, as well as several others, seems to exhibit quite as many lines as would be seen in the Solar Spectrum under similar circumstances of diminished light and of dispersive power. It, as well as Aldebaran and Arcturus, possesses the "D" line and altogether resembles the Sun very closely. Sirius in addition to the three bars, has lines corresponding with B and C, and indications of other lines between. Mr. Huggins remarked on the extreme importance of obtaining the *exact position* of the lines relatively to those in the Solar Spectrum, and stated that his measures were taken by a direct comparison with a Sodium line thrown into the apparatus, and viewed with the Stellar Spectrum. Mr. Huggins had also compared directly the Spectra of other metals with the Star Spectra. As a supplement to eye-observations and in the hope of obtaining some information of the relative temperatures of the Stars, he had succeeded in photographing the more refrangible portion of the Spectra of Sirius and Capella, Professor W. A. Miller having found that the invisible Spectrum has a connection with the temperature of the source of light.

Mr. Pritchard asked how it was possible that the exact line could be known: the least movement of the instrument would cause an alteration of place.

Mr. Huggins replied, the position of the .Sodium line in the apparatus had been compared with the line D in the Solar Spectrum, and that the apparatus was so constructed that the least movement of the telescope would cause the Spectrum to flash out of view;, but not alter its position relatively to the spectrum of comparison.

Mr. Carpenter, the actual observer of the Spectra at Greenwich, stated that very many more lines were seen in the Spectra, but only those measured were introduced into the diagram.

Mr. Huggins said, that the shaded bars in *a* Orionis, as represented in the diagram, were not truly bars or bands, but groups of fine lines, several of which he had measured.

On a "Disturbance of the Earth's Gravitation in the Neighbourhood of Moscow," by M. Otto Struve. The latitude of an Observatory in the neighbourhood of Moscow was carefully observed, but differed from the computed latitude by as much as 8″·0; upon observations being made at a variety of contiguous stations it was found that while in one line the latitudes, as determined by direct observation and by triangulation from distant well-known points, agreed, to the North existed a line in which all the co-latitudes were increased, and to the South one in which they were diminished in an equal ratio. The deviation of plumb-lines, at the extremities of the space affected, amounted to as much as one fiftieth part of the arc of convergence: North and South the deviation took place in the same degree—at twelve miles from the central line it was at a maximum: at thirty-five miles it disappeared, giving a total belt of ground affected from North to South of about seventy-four miles, while in the East and West direction the limit was not yet arrived at, but the extent of surface affected was much greater.

Mr. Schweitzer, the Director of the Moscow Observatory, who had investigated the matter, thought the only possible explanation was that a large trough of the earth below the surface had a less density than the general crust of the earth in that district, and calculated that a prism of three miles deep and eighteen miles broad of half the earth's usual density, with another prism on each side of greater density, but still less than the general rocks of the country, would produce the result in question.

Colonel Strange.—The ground where this deviation takes place is not mountainous?

M. Struve. No—it is a great plain, with slight undulations not sufficient to account for a tenth part of this anomaly.

Colonal Strange observed, that the subject was about to be taken up in India—where the attraction of mountains often produced deviation of the plumb-line.

Captain Toynbee said, that the plumb-line was often affected by the sea, from which it deviated, as it were, owing to a deficiency of matter.

The Astronomer Royal observed, that the fact of the disturbance itself was not more noticeable than the admirable manner in which it had been traced out by the Russian observers.

In answer to a question by Mr. Cayley, M. Struve said that the deviation occurred in an ellipse, diminishing East and West, and not in an indefinite line.

On a "New mode of figuring Glass Specula," with a particular description of the machinery employed, by the Rev. H. C. Key, of Hereford.

Professor Selwyn exhibited several photographs of the Solar disc, and said he was sure the Society would be glad to hear that arrangements had been made to continue the production of these "Cartes de Visite" of the Sun, and that a proper apparatus for the same purpose had been ordered by the Russian government.

The Astronomer Royal noticed that these photographs were not so distinct at the edges as in the centre, proving that this was really a physical appearance of the Sun: he should like to have seen the photographs furnished with some co-ordinate lines, to which to refer the spots.

Mr. De la Rue considered that although the marginal indistinctness might be partly due to physical causes, it was attributable in some degree to the nature of the apparatus employed.

It was stated that the Photo-heliograph had been returned to Kew from Cranford.

The Meeting, which was very numerously attended, then adjourned.

THE PLANETS FOR MAY.

Mercury is in the Constellation of Taurus, and will be well situated for observation in the evenings about the 20th of the month, setting about an hour and a half after the Sun. The Phase and appearance of the Crescent should be observed.

May 1st.	R. A. 3 19 56	Dec. N. 19 47½	Diameter	5″·4.
31st.	5 44 53	- 23 32	,,	10″·2.

Venus passes from Taurus into Gemini, and continues to be the evening Star; she passes the Meridian between three and four o'clock in the afternoon and sets between ten and eleven.

May 1st.	R. A. 4 50 2	Dec. N. 23 55	Diameter	12″·6.
31st.	7 24 27	- 24 16½	,,	15″·4.

Illuminated portion of Venus 0·773.

Mars continues in the Constellation of Gemini, but is getting rapidly less interesting.

May 1st.	R. A. 6 9 30	Dec. N. 24 50½
31st.	7 29 59	- 23 12

Jupiter is splendidly visible during the evenings, remaining in Virgo.

May 1st.	R. A. 13 16 53	Dec. S. 6 28	Diameter	41″·2
31st.	13 7 39	- 5 38½	,,	38″·8

Saturn also continues in Virgo, and is well situated for observation.

May 1st.	R. A. 12 2 17	Dec. N. 2 32½	Diameter	17″·2
31st.	11 59 18	- 2 45½	,,	16″·4

Dimensions of Ring—Outer Major Axis, 1st 43″·0. Outer Minor Axis, 2″·4
,, ,, 31st 41″·0. ,, 2″·2

Uranus continues in the Constellation of Taurus, but is not favourably situated for observation.

THE MINOR PLANETS.

The following are the Minor Planets which will be on, or within one hour of Right Ascension on either side of the Meridian, between 9 and 12 o'clock during the evenings of May. Their places are to be found in the Supplement to the Nautical Almanac for 1866.

	Magnitude.		Magnitude.
Metis	9·7	Harmonia	9·3
Eunomia	10·1	Isis	11·6
Psyche	10·7	Calypso	12·5
Euphrosyne	12·5	Mnemosyne	11·5
Polyhymnia	11·4	Olympia	11·9
Atalanta	14·3	Erato	12·6

NOTES AND GLEANINGS.

New Planet.—On the night of March 15-16, a new minor Planet was discovered by M. Luther of Bilk, in R. A. 180° 12′ 6″·8, and Declination −7° 20′ 3″·4. He proposes to call it *Diana*, and it will take the cardinal number of 78. The following elements have been calculated by M. Tietjen :—

Epoch = 1863, March 31·5, B. M. T.
M = 65° 44′
π = 92 16
Ω = 339 10
ι = 11 28
ϕ = 13 12
μ = 772″·860
Log. a = 0·441271

New Comet.—A Telegraphic Despatch received by the Astronomer Royal from Göttingen, from M. W. Klinkerfues, gives the following :—

Position of a Comet observed at Göttingen, April 11,625 :
R. A. Decl.
309°·05 −2°·85
Horary Movement.
0′ +5′

The Comet may now be found below the principal stars in *Delphinus.*
Astronomical Register Office, April 14, 1863.

We forwarded the above note of the appearance of this Comet to those of our subscribers who are not fellows of the Astronomical Society on the 15th ult. The following approximate elements by Mr Hind bear some resemblance to those of Comet I. 1824, which was only observed for four weeks, so that possibly its path was not very certainly determined.

P. P. = 1863, March 22, 8h. 21m. G. M. T.
π = 261° 11′
Ω = 244 25
ι = 86 34
Log. q. = 0·9899
Motion—retrograde.

Another Comet.—Mr Romberg, of Mr G. J. Barclay's Observatory, Leyton, gives the following observation of a Comet discovered by M. Respighi at Bologna on the 12th ult., in the constellation of Pegasus :—

April 19th, 15h. 22m. 37s. G.M.T. R. A. 23 34 21 Decl. +32 35·6
Daily Motion in R.A. 8m. 5s. to the East. In Decl. 1° 43′ N.

Scientific Balloon Ascent.—The ascent which we noticed in our last number as having to be postponed, took place on the 31st of March. The balloon attained a height of 4½ miles. Mr Glaisher states that one result of his several ascents is, that the hitherto accepted theory of a decline of one degree of temperature for every 300 feet of elevation must be abandoned, as he found that within 100 feet of the earth a decline of one degree took place, while at a height of 30,000 feet, more than 1000 feet were required to produce a similar change.

Mr Glaisher made another ascent on the 18th ult., attaining the same altitude : in descending, the balloon narrowly escaped falling into the sea.

Gamma Virginis.—The present position and distance of this interesting Binary Star have been kindly forwarded to us by the Rev. W. R. Dawes, who remarks—"Though I have at present procured but one set of measures, the circumstances under which it was taken were remarkably good, and I have therefore considerable confidence in the results, though they may be slightly modified by subsequent observations. It is as yet rather early in the season for this object, which is usually best observed in the calm twilight of the evenings in May."—(Mr Dawes writes on the 18th ult.)

γ *Virginis:* Pos. = 166°·70 ; Dist. = 4″·012 ; Epoch, 1863·250.

ASTRONOMICAL OCCURRENCES FOR MAY, 1863.

DATE.		Principal Occurrences.		Jupiter's Satellites.		Meridian Passage.
		h. m.			h. m. s.	h. m.
Frid	1	16 6	Conjunction of Moon and Jupiter, 5° 39′ N.	3d Ec. R.	11 26 18	Moon. — 10 26·6
Sat	2					11 19·3
Sun	3	2 52	Full Moon	2nd Oc. D. „ Ec. R. 1st Oc. D.	11 1 14 26 30 15 52	12 15·6
Mon	4			1st Tr. I. „ Sh. I. „ Tr. E. „ Sh. E.	13 2 13 32 15 14 15 45	Saturn. — 9 12·7
Tues	5	1 8	Conjunction of Uranus and Venus, 1° 30′ N.	2nd Tr. E. „ Sh. E. 1st Oc. D. „ Ec. R.	8 17 9 24 10 18 13 0 30	9 8·6
Wed	6			1st Tr. I. „ Sh. I. „ Tr. E. „ Sh. E.	7 28 8 1 9 40 10 14	9 4·5
Thur	7					9 0·4
Frid	8			3d Oc. D. „ Oc. R. „ Ec. D. „ Ec. R.	10 40 13 1 13 8 0 15 23 52	8 56·3
Sat	9	19 15	Moon's Last Quarter			8 52·3
Sun	10			2nd Oc. D.	13 18	8 48·2
Mon	11			1st Tr. I. „ Sh. I.	14 47 15 27	8 44·1
Tues	12			2nd Tr. I. „ Sh. I. „ Tr. E. „ Sh. E. 1st Oc. D. „ Ec. R.	8 6 9 28 10 34 11 58 12 4 14 54 39	8 40·1
Wed	13			1st Tr. I. „ Sh. I. „ Tr. E. „ Sh. E.	9 14 9 55 11 27 12 9	8 36·0
Thur	14			1st Ec. R.	9 23 12	8 32·0
Frid	15			3d Oc. D.	14 2	8 28·0

DATE.		Principal Occurrences.		Jupiter's Satellites.		Meridian Passage.
		h. m.			h. m. s.	h. m. Jupiter. —
Sat.	16					9 34·8
Sun	17	4 48 5 42	New Moon Eclipse of the Sun			9 30·5
Mon	18	9 48	Conjunction of Uranus and Mercury, 2° 10′ N.			9 26·3
Tues	19	1 0 2 35 4 3	Greatest Elongation of Mercury, 22° 15′ E. Conjunction of Moon and Uranus, 1° 15′ N. Conjunction of Moon and Mercury, 3° 25′ N.	3d Sh. E. 2nd Tr. I. „ Sh. I. „ Tr. E. 1st Oc. D. 2nd Sh. E.	9 18 10 23 12 3 12 52 13 50 14 32	9 22·1
Wed	20	14 57	Conjunction of Moon and Venus, 4° 46′ N. Mercury well situated for evening observation	1st Tr. I. „ Sh. I. „ Tr. E. „ Sh. E.	11 1 11 50 13 14 14 3	9 17·9
Thur	21	6 30 8 16 19 30	Conjunction, Moon and Mars, 4° 40′ N. Conjunction of Venus and ε Geminorum, 0° 2′ S. Ditto, 2m·3 W.	1st Oc. D. 2nd Ec. R. 1st Ec. R.	8 16 8 58 40 11 17 27	9 13·7
Fri.	22			1st Sh. E.	8 32	9 9·5
Sat.	23	11 37	Occultation, 60 Cancri (6)			Moon. — 4 32·9
Sun	24					5 16·5
Mon	25	8 47	Moon's First Quarter			5 59·6
Tues	26			3d Tr. E. „ Sh. I. 2nd Tr. I. 3d Sh. E.	9 34 10 49 12 43 13 17	6 43·0
Wed	27	13 35	Conjunction, Moon and Saturn, 7° 56′ N.	1st Tr. I. „ Sh. I.	12 49 13 45	7 27·6
Thur	28	22 12	Conjunction of Moon and Jupiter, 5° 45′ N.	1st Oc. D. 2nd Ec. R. 1st Ec. R.	10 4 11 35 36 13 11 48	8 14·5
Fri.	29			1st Sh. I. „ Tr. E. „ Sh. E.	8 14 9 29 10 27	9 4·6
Sat	30					9 58·8
Sun	31					10 57·2

TABLE OF DOUBLE STARS,

Right Ascension, Twelve and Thirteen Hours.

CLASS I.—Division 1.

Stars from the 1st to the 7th Magnitude,
From 20" to 180" apart.

Name of Star, &c. Magnitudes & Distance. Position Angle.	Right Ascension and Declination.	Remarks.
24 Comæ Berenicis...... 5½—20"—7 272	12 28 20 +19 7½	
232 P. XII. Camelopardi 6—22"—6½ 327	12 48 15 +84 9	
12 Canum Venaticorum 2½—20"—6½ 227	12 49 45 +39 3	

CLASS I.—Division 2.

Stars from the 1st to the 7th Magnitude,
From 8" to 20" apart.

ζ Ursæ Majoris .... 3—14"·5—5 147	13 18 30 +55 38	

CLASS I.—Division 3.

Stars from the 1st to the 7th Magnitude,
From 3" to 8" apart.

γ Virginis .... *4— —4	12 34 50 — 0 42	

CLASS II.—Division 1.

Stars from the 7th to the 11th Magnitude,
From 20" to 180" apart.

32 P. XII. Virginis...... 7½—21"—7½ 198	12 11 10 — 3 12	
12 Comæ Berenicis...... 5—66"—8 168	12 15 40 +26 36	
δ Corvi..................... 3—23"—8½ 211	12 22 50 —15 45½	
143 P. XII. Virginis ... 6½—50"—11 105	12 31 45 — 3 37½	
196 P. XII. Virginis ... 6½—33"—9½ 308	12 44 20 — 9 36	

* See page 73.

TABLE OF NEBULÆ.

Right Ascension, Twelve Hours.

NAME OF NEBULA	Right Ascension.	Declination.
195 Hersc. I. Ursæ Majoris Small, but bright and very much elongated, the nucleus flashing up at intervals.	12 0 5	+43 49
98 M. Virginis .... A large nebula, but very pale and faint.	12 7 15	+15 39
95 Hersc. I. Canum Venat. Brighter than the last, with more tendency to condensation, but still rather faint.	12 8 50	+37 4½
35 Hersc. I. Virginis...... An oblong nebula, with a nucleus which appears almost stellar to the averted eye.	12 8 55	+13 54½
43 Hersc. V. Ursæ Majoris Fine, large and bright, with a palpable nucleus.	12 12 20	+48 3
61 M. Virginis .... Large, but faint and pale.	12 15 0	+ 5 13½
100 M. Virginis .... Round, and rather brighter towards the centre.	12 16 10	+16 34½
49 M. Virginis .... An interesting nebula, bright and well defined.	12 22 55	+ 8 45
88 M. Virginis .... A rather large oval nebula, with little or no sign of condensation.	12 25 10	+15 10½
24 Hersc. V. Comæ Berenicis A curious long nebula, but rather faint, especially at the ends.	12 29 40	+26 44
68 M. Hydræ .... Very pale, and so near the horizon as to be seen with difficulty.	12 32 15	−25 59
43 Hersc. I. Virginis ...... A remarkable little nebula, very much elongated, and brightening towards the centre.	12 32 55	−10 51½
60 M. Virginis .... By sustained attention this is seen double; it is by no means bright. Two other nebulæ, 59 M., and H. Junr. 1402 are seen in the same field with it.	12 36 50	+12 18
94 M. Canum Venaticorum Very fine and bright; of circular form, and condensing rapidly towards the centre.	12 44 35	+41 51½
72 Hersc. II. Virginis...... An oblong nebula, faint and pale. A pale round nebula, 74 Hersc. II, is seen in the same field.	12 46 5	+11 58
64 M. Comæ Berenicis ... Fine, large, and rather bright.	12 50 5	+22 25

THE TABLE OF NEBULÆ.—The arrangements adopted for observing and describing the foregoing Table of Nebulæ are identical with those which we explained last month. We have now arrived at an extraordinarily nebulous region of the heavens. In viewing the 13th object in the list, two other nebulæ will be seen at the same time, while in the case of the 15th, one other will be observed in the same field with it. While looking at 88 M. Virginis, (the 9th in our Catalogue,) the amateur is recommended to move his telescope above and to the right and left of it; a whole mass of nebulæ will thus be brought into view, some thirty of these objects being all aggregated in this locality. Owing to the protracted twilight, May is not a very favourable month for the observation of nebulæ, and until after the 7th or 8th of the month the moon will render all but the very brightest invisible.

ECLIPSE OF THE SUN.

A Partial Eclipse of the Sun will take place on Sunday the 17th of May, beginning about twenty minutes to six o'clock in the evening, and ending about a quarter past seven.

Mean Time at	Greenwich:	Edinburgh:	Dublin.
	h. m.	h. m.	h. m.
Begins	5 42·4	5 17·7	5 12·9
Greatest Phase	6 28·5	6 8·7	6 0·5
Ends	7 12·0	6 56·8	6 45·3
Magnitude of the Eclipse*	0·292	0·349	0·286

Right Ascension of the Sun—3 35 46. Declination—N. 19 19 47.

Although no observations of the character of those to be made at a Total or Annular Eclipse are to be expected, yet the opportunity may be taken, should the weather prove fine, of noting some of the attending circumstances; we therefore give a few hints as to the necessary preparations, which each observer may adopt according to his means or intentions.

The Latitude and Longitude of the place of observation, if not precisely known, should be obtained as nearly as possible.

The Clock or Watch, by which the observations of contact are taken, to be carefully regulated, and the rate and error ascertained.

The Telescope to be in good order, Micrometer in adjustment, Eye-pieces at hand so as to shift without loss of time, dark glasses ready, &c.

Should the aperture of the telescope be large, discs of cardboard ought to be prepared with which to limit it, in order to prevent fracture of the dark glasses; but the better plan is to use a reflecting eye-piece on the plan recommended by Mr Hodgson, wherein the image of the Sun is reflected *from the surface* of a piece of glass, *through* which the heat passes.

The observing seat to be steady and convenient, screens to be arranged so as to shield the observer from the glare of light, and cardboard discs, to fit round the telescope near the eye end, prepared for the same purpose.

Pencils and paper should be at hand, with blank diagrams and circles, to facilitate the record of any phenomena, and a sketch of the sun should be taken a short time previous to the eclipse, to note the position of any spots or groups that may be present on the disc.

---

* Mr Dickenson, of the Manchester Literary and Philosophical Society, says "Suppose a Victoria Shilling to represent the Sun: the Moon will appear to touch it first on the right side, at the last *r* in the word *Britanniar:*, and to leave it at the left side at the letter *i* in the word *gratia.*" A portion of the right hand half of the upper part of the Sun will therefore be concealed.

The time of first and last contact to be taken with great care; the points of contact; contact with spots or groups; the appearance and position of irregularities on the moon's limb to be carefully noted.

An eye-piece which will take in the whole disc of the sun should be used for the observations of contact: a higher power may be applied with advantage for scrutinizing the moon's limb.

The Barometer and Thermometer to be observed both before and after, and also during the eclipse.

And lastly it will not be time thrown away if the observer will *rehearse* the eclipse, as it were, a day or two beforehand, to assure himself that all necessary appliances are at hand and in working order.

ECLIPSE OF THE MOON.—A Total Eclipse of the Moon will take place June 1st about a quarter before 9 o'clock in the evening.

	h.	m.	
First Contact with Penumbra	8	49·3	
First Contact with Shadow	9	46·0	
Beginning of Total Phase	10	53·0	Mean Time
Middle of the Eclipse	11	26·0	at
End of Total Phase	11	59·0	Greenwich.
Last Contact with the Shadow	13	6·0	
Last Contact with the Penumbra	14	2·7	

The Eclipse begins on the left hand and passes off to the right, a little below the central line of the Moon, for *direct* view.

This Eclipse will give an opportunity of observing whether any change is caused in the appearance of the craters and other features of the Moon's surface, by the passage of the penumbra.

CORRESPONDENCE.

◆

THE D'ORSAN CONTROVERSY.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—I shall feel obliged if you will allow me to correct some slight inaccuracy into which your reporter has fallen in his otherwise faithful transcript of my remarks upon the D'Orsan controversy, at the last meeting of the Astronomical Society. I refer more particularly to the last paragraph, which conveys the impression that I am actuated by a revengeful and vindictive feeling against Dr D'Orsan personally, even to the extent of desiring or intending him some bodily harm; whereas the meaning I desired to convey was this—that on grounds of public morality, and out of regard to the common interest which scientific men have in the maintenance of their rights, I considered it a duty to investigate to the very bottom, and to expose with the utmost possible publicity, any such appropriation as that of which Dr D'Orsan had been guilty.

You also make me say that in Dr D'Orsan's two photographs there is a difference of illumination, which on the contrary is identically the same in both: the difference in the *extent of the illumination*, which was designed to substantiate a pretended difference of phase, at two different epochs, was effected, as I have elsewhere shown, by the simple process of 'painting out.'

I am Sir, your obedient servant,

Observatory, Cranford, Middlesex,
April 3, 1863.

WARREN DE LA RUE.

INSTRUMENTS, &c., FOR SALE.

Applications respecting prices and other particulars to be made to the Editor of this paper—if by letter, enclosing stamp for postage of answer.—These notices are inserted free of charge to Subscribers.

Binocular Newtonian Reflector, focal length 7 feet, Mirrors, 6¼ inches, with altitude circle, achromatic finder, a variety of eye-pieces, and a superior micrometer by Troughton. [6]

Astronomical Refractor, focal length 4 feet, aperture 3⅜ inches, complete, on a Portable Universal Equatoreal Stand. [3]

Equatoreal Mounting, (for Latitude 51 or 52), adapted for a telescope of 6 or 7 foot focus.—12 inch Circles, Driving apparatus, &c., all of the most approved construction. [5]

Achromatic Refractor, 44 in. focus, 3½ in. aperture, on a Fraunhofer's Universal Equatoreal Stand. [7]

Newtonian Reflector, 7 ft. focus, 7½ in. aperture, eight eye-pieces, powers from 30 to 360, Equatoreally mounted. [11]

INSTRUMENTS, &c., WANTED.

Achromatic Telescope, of not less than 4¼ in. clear aperture; Mounting no object. [8]

Spectrum Apparatus, of modern construction. [9]

A Copy of the **Bedford Catalogue,** in good condition. [10]

NOTICES TO CORRESPONDENTS.

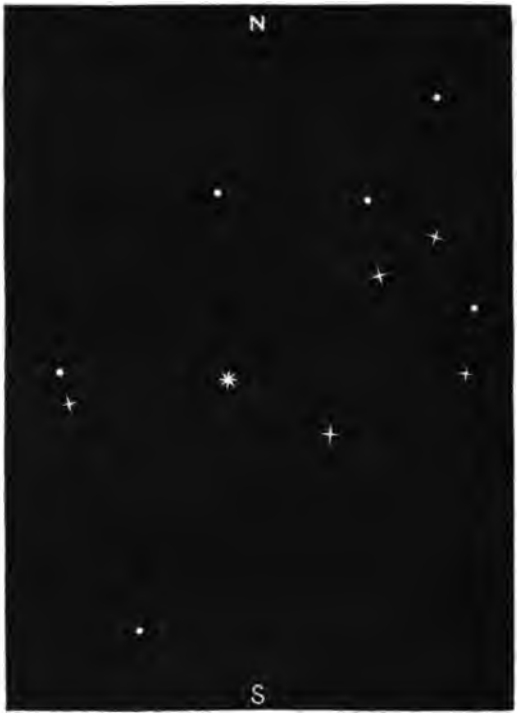
Communications respecting the *Companions of Sirius—Winnecke's Periodical Comet—The Pleiades—Iris Diaphragm for Variable Stars*—and some minor paragraphs, are unavoidably postponed for want of space.

ERRATA.—In No. 4, Page 51, line 26, for *Hercules*, read *Herculis.*—Page 53, line 17, for *Anwers*, read *Auwers.*—Page 63, line 8, for 7·4, read 74: line 27, for *nebulæ*, read *nebula.*—In No. 3, the running title of the Positions of the Planets was printed *February* instead of *March.*

CONTENTS.

Page
Mr Burr's Lecture on Celestial Photography 65
Meeting of the Royal Astronomical Society, April 10 68
Positions of the Planets 72
Notes and Gleanings:
New Planet——New Comet——Another Comet——Scientific Balloon Ascent——Gamma Virginis 73
Astronomical Occurrences for the Month 74
Table of Double Stars 76
Table of Nebulæ 77
Remarks on ditto 78
Eclipse of the Sun 78
Eclipse of the Moon 79
Correspondence, &c., ... 79
Instruments for Sale, &c., ... 80

LONDON: Private Press—Observatory, Downs Road, Clapton.



THE PLEIADES.

AS SEEN WITH THE UNASSISTED EYE,

February 15, 1863.

The Astronomical Register.

No. 6. JUNE. 1863.

TO OUR READERS.

The "Astronomical Register" (commenced as an experiment) has now reached its sixth number, and it becomes necessary to inform our readers, that it will be impossible to continue the publication unless considerably more subscribers can be obtained. As some time will probably elapse before the adequate number of new names can be added to the list, we shall endeavour for the present to reduce the working expenses as much as possible, and have determined henceforth not to forward to subscribers the duplicate copy, except to those who have paid in advance for the Register beyond June. The price of a single copy has been raised to *6d.*, but the subscription will continue to be *2s.* per quarter. Subscribers may, perhaps, imagine that they thereby suffer a disadvantage, but it is hoped that the transmission of their numbers post free, the gratuitous insertion of their notices of instruments, and the answers returned to their enquiries, will be deemed an equivalent for the not very large excess of subscription over the selling price.

It is to subscribers, moreover, that we must look for the necessary aid to enable us to carry on our paper; and we much regret to state, that the subscription is not at present nearly sufficient to meet the actual outlay involved in the publication.

We desire to gratefully acknowledge the exertions of many friends, and to express our satisfaction at the decided approval the Register has met with, and our thanks for the kind wishes we continue to receive for its success; at the same time we feel constrained to make an urgent appeal to our subscribers generally, and all interested in astronomical science, for support and co-operation, being most reluctantly compelled to assure them, that unless the subscription list be speedily and considerably augmented the Astronomical Register must be discontinued.

June, 1863.

ROYAL ASTRONOMICAL SOCIETY.

Seventh Meeting, May 8th, 1863.
The Astronomer Royal, *President*, in the chair.
Secretaries: Rev. C. Pritchard and Mr. Hodgson.

The minutes of the last meeting were read. Thirty presents were announced, among which Baron Plana's work "On the Cooling of the Mass of the Sphere and the Cooling of the Surface" was specially referred to.

George L. Tupman, Lieut. Royal Marine Artillery,
Celestin Bohn, Esq., F.S.A., and
Henry Johnson, Esq.

were balloted for, and duly elected Fellows of the Society.

The following communications were read :—

Two Papers by Sir Thos. Maclear, containing "Observations of Enckes' Comet" in June 1861, and subsequently, at the Cape of Good Hope.

'On the Solar Spots"—Translation of part of a letter from M. Wolf, of Zurich, to the Astronomer Royal, in which he gives the ratio of the number of Spots as follows :—

1858	50·9
1859	96·4
1860	98·6
1861	77·4
1862	59·4

he also makes a comparison of the frequency of the Spots and Auroræ Borealis, and states that the 11 year period of the Spots shows itself in Auroræ as well, and that a longer cycle of 56 years is also becoming apparent in the Solar Spots. M. Wolf also refers to the changes which take place in the celebrated variable Star η Argo which in its period of 46 years has 2 maxima and 2 minima, passing from the 4th magnitude to the 2nd, declining again, and then after rising to a brilliancy exceeding that of Sirius, subsiding to the 4th magnitude.

The Astronomer Royal remarked that the attempt to identify the frequency of the Solar Spots with the swing of the magnets, had been successful, but that the extension of the process to tracing the connection between the Spots and the Auroræ would require a long time to establish. With respect to the magnets, the most remarkable "swing" was about 2 o'clock, p.m. to the west, but the extent was different at different seasons, and also differed for the same season in different years,—and it was this variation in different years which coincided in intensity with the frequency of the Solar Spots. The connection between the oscillations of the magnets and the Auroræ was well known, the very slightest symptom of an Aurora causing agitation of the instruments. On the subject of η Argo, he remarked that the reduction of the variability of the star to a graphic form, as shown by M. Wolf, was very instructive, and noticed the theories to account for such variability, as the occurrence of large obscure patches on the star, the existence of opaque companions, and other hypotheses.

Mr. Hodgson called attention to the fact that on the occasion of the remarkable disturbance and light seen in a Solar Spot on the 1st Sept. 1859, Auroræ had been seen all over the world.

Mr. Glaisher stated that the occurrence just referred to, was a solitary coincidence, and that with that exception there was at present no evidence from the Greenwich observations of the connection between Solar Spots and Auroræ.

Mr. Airy stated that between the 28th August and 8th September 1859, the magnetic disturbance was the greatest on record, that the telegraphic communication all over the world had been interrupted, and the sky everywhere covered with Auroræ.

Mr. C. V. Walker, as a telegraph engineer, and especially connected with lines to the Coast, could testify that at the end of August and beginning of September, complaints of the interruption of the circuits and failure of messages to and from families at the sea side were more frequent than at other times of the year.

The Astronomer Royal then made an oral statement of the substance of a Paper " On the Discordance of Zenith Distances of Stars, as determined by Direct Observations and Reflection." With a Mural or Transit Circle, the Star is first observed by pointing directly to it, and then by looking at its image in a basin of mercury, and the mean of the two readings gives the circle reading for the horizontal point, from which the zenith is readily determined. Prior to the introduction of this method by Mr. Pond, reference had been made to a plumb line. Upon adopting this method with the Mural Circle at Cambridge, Mr. Airy found a difference between the position of stars on the north and south sides of the zenith when determined by reflection and direct observation. Thus stars on one side of the zenith gave a North Polar distance by reflection greater than by direct vision, and on the other side of the zenith a less N.P.D. than when directly observed, and the quantity was too great a fraction of a second to be doubtful. This was mentioned in a Paper read to the Cambridge Philosophical Society, " On the Latitude of the Observatory at Cambridge," and upon his removal to Greenwich the same result was observed. In the old observing buildings of Bradley, the slits were very narrow, and it was recorded that Dr. Maskelyne had them opened wider, with an improvement in the definition of the stars. Mr. Pond found the wind disturbed the surface of his mercury trough, and he therefore had the shutters made to open either 6 inches or 2 feet, the effect being that in general the narrow aperture only was used, and this was the case or several years after Mr. Airy's arrival. He then restored the greater aperture of 2 feet, and in 1850, when the new Transit Circle Room was built, the shutters were made 3 feet wide, with no power of reduction. This enabled the observations to be divided into three classes according to the three periods. In the first group with a narrow slit, the telescope had to be less inclined from the zenith for direct vision than for reflection. In the second class with the 2 feet aperture, the inclination was the same for both kinds of observation, and the telescope had to be pointed as much below the horizon for the reflection image as it had to be above for direct observation; while in the third period, with the wide opening, the inclination of the telescope had to be greater for direct than reflection vision. Then came the question—what was to be done with stars at a distance from the zenith. Mr. Airy had been accustomed to take the mean of the two distances, but he wished to test which class of observations were the true ones, and the difference in the shutter openings supplied the means. He took the observations of the Pole Star in the three periods, and deduced his latitude from each group. If the result obtained from direct vision agreed through the three periods, then those observations would be the correct ones; if the reflection observations agreed all through the series that would be the right method, but if the mean readings only were consistent, this would show such mean was requisite. The result was, that neither the direct nor reflected observations gave the same latitude during the three periods, but the mean reading did—and with such accuracy, that any further correction could only be less than one-tenth of a second.

Other causes might have been supposed to contribute to this result, such as flexure of telescope, sagging of wires, &c., but these had been gradually eliminated, and the only remaining effect must be due to the state of the atmosphere surrounding the instrument. This was not only important to the Greenwich Observatory, but to Astronomy generally, as shewing that if he had neglected the reflection observations he should have been out in his latitude half a second, and at different times nearly a whole second, and he considered that the latitude of other observatories was probably uncertain, to the extent of half a second.

Colonel Strange asked whether the physiological effect on the eye of looking downwards and upwards, well known to observers with the microscope, had been considered.

The Astronomer Royal explained that as in all the observations the eye looked upwards for direct vision, and downwards for reflected, and there was a difference in the readings when looking the same way—the result could not be influenced by this cause.

Admiral Manners remarked that, although the sea horizon was a very troublesome thing, still, that some navigators arrived at very exact results, and he thought the Greenwich observers by long practice had arrived at nearly the perfection of observing.

Mr. Pritchard pointed out the marked correlation of the sciences which was now constantly visible. At the last meeting the effect of geological structure on astronomical observations had been strikingly shown, and now we had a case of the effect of what might be called meteorological conditions.

Mr. Glaisher who had made nearly all the Cambridge observations referred to by the Astronomer Royal, and many of those during the early period at Greenwich, believed that the observers were perfectly free from all bias caused by looking up or down. He further thought that from the results of his recent balloon ascents, we must be prepared at no distant time to review our corrections for refraction. He had been engaged in discussing many thousand meteorological observations made in India, and found the conditions so different that he expected every place must have its own table of refraction in future.

Mr. Vignoles remarked that when it came to a difference of a fraction of a second, personal equation, which was known to exercise an influence on all observations, might account for the result.

The Astronomer Royal in closing the discussion, mentioned that in the first period of observation from 1836 to 1844, the result of one kind of observation was, in all cases, less than the true one; from 1844 to 1850, no correction was required; and from 1850 to 1860, the results were greater than the truth. On the whole, the reflection observations alone were a little better than the direct ones. He also said that great pains had been taken to make the observers comfortable by proper pits and stages, so that inconvenience of position should not alter the observations.

A Paper by Mr. Romberg, of Mr. Gurney Barclay's Observatory, containing "Elements of Comets II and III, 1863. Mr. Hodgson described the appearance of these Comets as seen by him.

"On the Parallactic Inequality of the Moon as a Test of the Increased Solar Parallax"—by Mr. E. J. Stone. The result of the discussion of the Greenwich observations given in this paper was not very decisive, but still had a tendency to support the increased value of the Solar Parallax.

The Astronomer Royal explained that at the recent opposition

Mars was distant from the Earth 4-10ths of the Sun's distance, and that the greatest possible difference in the place of Mars, as seen from different stations on the earth, would be 40 seconds. That something similar might be observed with the Moon, its different places in different parts of its orbit giving 240 seconds to work with, and the Greenwich Altazimuth supplied the necessary observations, but the Lunar theory was so complex that the result alone was not to be relied on. Still it supported the deductions from the observations of Mars, and showed the Sun's distance must be reduced by two, or perhaps three, millions of miles.

A letter from Mr. Dawes, containing the result of his examination of three eye-pieces sent to him by Mr. Hodgson. The first, constructed according to the Astronomer Royal's formula, appeared not well made, had a small field, and some colour. The second, a "Kellner," was also not a good specimen, the diaphragm being too small, but the definition was good to the edge. The third, an "Aplanatic," had a large field, was pleasantly achromatic, but had a double "ghost." On comparison of these forms with the Huyghenian made by Ramsden, Tulley, and others, and a Kellner made by the inventor himself, Mr. Dawes thought little was gained by the modifications, although with good workmanship, each might have its advantages.

Professor Challis "On the Indications of Atmosphere in the Sun, Moon, and Planets."

Professor Selwyn exhibited a series of portraits of the Sun from the time of the set last presented by him, and which were now taken with great regularity, thanks to a grant of £50 from the Royal Society to his photographer.

Two pictures a day were taken, if possible, so that from February 7th to May 2nd, 43 had been obtained. There were generally about seven bright days in a semi-rotation of the Sun, once in the period abovementioned nine had occurred. The spots could readily be traced in the course across the Sun's disc from East to West, and he hoped the pictures would help to decide whether the spots were cavities or depressions, according to Wilson's theory, or something like clouds, as now stated by Bunsen and Kirchoff, reasoning from the spectrum observations. Mr. Carrington also doubts the theory of the spots being hollows, as he has seen the nucleus of a spot walk out, as it were, from the penumbra.

It has been stated that Spots have been seen as notches on the sun's edge, but this is probably due to the use of a very low power. When indications of this have been seen in the photographs, observations with greater power have shown that the ring of light was complete beyond the spot. The photographs would also assist materially in the study of the Faculæ.

Mr. Hodgson described some recent Solar Spots, and expressed his opinion that what was wanted was not small pictures of the whole disc, but individual spots magnified to 6 or 8 inches in diameter.

Professor Selwyn promised that these would soon be accomplished, and also that his pictures should have position lines.

The Astronomer Royal called attention to the evidence offered by the photographs of the degradation of light towards the edge of the disc, which he said could also be observed during a partial Solar eclipse where the Moon's limb crossed the Sun.

An observation of the occultation of κ Cancri made by a friend of Mr. Dawes was communicated by that gentleman. The observer stated that three-fourths of the light disappeared some time before the star was finally extinguished by the Moon.

Observations of the same occultation by Mr. Gorton, and Mr. Burr, both stated the disappearance to be "instantaneous."

Mr. Gorton also sent observations of the Occultation of *e* Leonis and of Jupiter's 2nd Satellite.

The Rev. F. Howlett commenced reading a paper accompanying 55 more sheets of his drawings of Solar Spots during the last 18 months. The hour being late, the conclusion of the Paper was, at the suggestion of Admiral Manners, then occupying the chair, postponed till the next meeting.

The Iris Diaphragm for variable star observations, described in another part of this number of the "Astronomical Register," was exhibited by Mr. Brothers.

In adjourning the meeting, Admiral Manners drew attention to the presence of Mr. G. P. Bond, the eminent American Astronomer— and that gentleman briefly expressed the pleasure he had derived from attending the sitting, and his thanks for the publications of the Society forwarded to him. The Bishop of Natal was also present during the greater part of the meeting which did not adjourn till a late hour.

NEW DIAPHRAGM FOR VARIABLE STARS.

At the meeting of the Royal Astronomical Society on the 8th May, Mr. A. Brothers, of Manchester, exhibited and explained an apparatus for determining the magnitudes of Stars, to which he had applied the name of the "Iris Diaphragm." The effect of this invention, the action of which must be seen to be properly appreciated, is to increase or diminish the aperture of the telescope at will, and what is most important, in a circular form, which, we believe, has never before been attempted. It is done by means of a small sheet of India rubber, stretched between two rings of metal, which open or close the aperture by moving in opposite directions. The apparatus is attached to the dew-cap of the telescope, and is worked by a wheel and pinion, the rod from the latter being carried to the eye-end. The extent to which the aperture is contracted is noted by means of a sort of wheel, with projecting spokes, so that the observer is enabled to view a Star with an aperture of any desired diameter, without leaving the eye-end of the telescope at all. To the members of the "Variable Star Association" this apparatus will prove particularly useful.

THE GLASGOW OBSERVATORY.

The late Sir W. Keith Murray's nine-inch Equatoreal was fully installed at the Glasgow Observatory on the 30th of April last, on which occasion Mr. R. Grant, the Professor of Astronomy at Glasgow, gave a very interesting address on "Observing Astronomy." We extract the following passages:—Alluding to the establishment of the Royal Observatory at Greenwich, Mr. Grant said—

"I hold in my hand a volume which may be considered as combining within its moderate dimensions, the principal Astronomical Theories of modern times, and the results of all the Observations made at Greenwich since the middle of the last century. It consists almost entirely of figures; but in regard to the scientific value of its contents, and their bearing on the practical purposes of life, it is unquestionably one of the most wonderful volumes in existence. It is the 'Nautical Almanac,' a work which may be purchased for half-a-crown at any marine bookseller's shop. To the Astronomer and the Mariner this volume is alike indispensable. * * * There are, doubtless, several gentlemen present on this occasion who have a direct interest in the shipping of the Clyde. Are you aware how absolutely dependent your richly laden barques are upon the numerical indications of this unpretending volume? * * * How many thousands of our countrymen and country-women are annually wafted to the opposite shores of the globe, little dreaming to what extent their safety is dependent on this book of figures. Such then is the important part which Greenwich Observatory plays in upholding the interests of this great country. * * * I may add, that the Astronomer Royal, the Superintendent of the Nautical Almanac, and the Astronomer at the Cape, are placed by Her Majesty's Government under the direct control of the Lords Commissioners of the Admiralty. They are, in fact, recognised as occupying official positions, in virtue of which they are actively engaged in upholding the interests of the country as a great maritime power."

The above forms a very complete answer to those who sarcastically ask "what is the use of Astronomy?" As to Amateur Observers, Mr. Grant remarked—

"I do hope that the youth, not merely of the City of Glasgow but of the West of Scotland generally, will avail themselves of the valuable instrumental means which the Observatory now possesses for instruction in practical Astronomy. I would remark also, that to gentlemen who have a little leisure time, and a taste for scientific pursuits, this establishment now possesses instruments admirably adapted as models for the prosecution of Astronomical Observations. Many gentlemen in England have done good service to Astronomy, while prosecuting the science as mere amateur observers."

The Equatoreal is mounted upon an iron casting, resting on a massive pillar of stone, in an octagonal tower within the Observatory grounds. The object-glass of the telescope is of nine inches aperture, and the focal length is thirteen feet: the whole is by Messrs. Cooke and Sons of York. There is also in the Observatory a small transit instrument, and a fine sidereal clock, specially constructed by Mr. Charles Frodsham, of London.

THE PLEIADES.

In the Monthly Notices for March 13th is a map of the Pleiades, contributed by the Astronomer Royal, shewing the Stars seen with the naked eye on the evening of the 15th February last, a copy of which we present to our readers with this number. This group is interesting, as being easily separated or resolved into Stars without optical assistance. After observing the Pleiades we may look at the cluster, entitled the "Præsepe" in Cancer, or the great cluster in Perseus, which appear like small faint clouds, but are separated into splendid collections of Stars with the lowest power. We may then proceed to the fine cluster in Hercules, or that in Canes Venaticorum, which require some considerable means to resolve into Stars, and from them we may proceed to those mysterious nebulæ, which the great reflectors of Herschel and Rosse are unable to cope with. Although analogy would teach us that all the nebulæ are but masses of Stars, yet there are features in some of them which seem to militate against this theory. Continued observation with most powerful means can alone lead to decision on this point—one of the most interesting, as regards the construction of the universe.

THE ECLIPSE OF THE SUN, May 17th.—The greater part of the day on the 17th ult. was so much overcast that a sight of the Eclipse was almost despaired of; but, most fortunately, the sky became clear just previous to the time of the phenomenon, and the Eclipse was very well observed. Owing to the low altitude of the Sun, no good observation could be made at this place, the telescope having to be removed from the Observatory into the garden in order to reach the Sun : and we could not do more than obtain a drawing of the Spots, one tolerably large one, and three smallish groups, which were present on the disc, and note the serrated character of the Moon's limb.

In a letter from Maresfield, May 18th, Captain Noble says "I saw the commencement of the Eclipse yesterday ; the first perceptible indentation of the Solar limb was made at 5 h. 44 m. 55·3 s. Local mean time."

At Clapton, the termination of the Eclipse was not seen, the Sun descending into a bank of clouds.

Clapton, May 20th, 1863.

NOTES AND GLEANINGS.

COMET III, 1863.—Several computers have determined the elements of this Comet. All are of accord, but probably the following by M. Karlinski of Krakau (*anglicè* Cracow) are slightly the most accurate :—

T = 1863, Ap. 20·89771, Berlin M. T.
π = 305° 31′
Ω = 249 59
ι = 85 28
Log. q. = 0·62844
Motion—direct.

A "TREATISE ON ASTRONOMY," by the Rev. R. Main, is announced to be in the press. It will be published by Messrs Deighton, Bell, & Co., of Cambridge.

THE "ASTRONOMY OF THE BIBLE," Seven Lectures by Professor O. M. Mitchel of Cincinnati, who died last year, a Federal General in active service, are to be published immediately by Messrs Blakeman & Mason of New York. The volume will contain a brief biography and portrait of the author.

COLONIAL ASTRONOMY.—We learn from the *Melbourne Argus* of the 23d of February that the new observatory, for which a grant of £4500 was recently voted by the Colonial Legislature, is nearly completed, and the colonists are proud of it, as they may well be. The transit instrument will be second only to those at Greenwich and Capetown; and Airy's zenith sector is at present in constant use in connexion with the survey of the colony, and the determination of the boundary between Victoria and South Australia. It has been determined to provide this observatory with a telescope of much greater optical power than any previously used in the southern hemisphere, to be employed chiefly in observations of nebulæ; and the advice of the Royal Society was desired as to the best instrument to be used. We believe that it has been decided that a reflector as large as, and similar to Lord Rosse's, to be constructed in this country, should be employed. Should this course, which really seems rather a hazardous one, be adopted, we trust that the effects of the long voyage, and extremes of temperature, and loss of figure and polish, may all be avoided, and that the colony may reap all the laurels it deserves.—*English Churchman.*

TABLE OF NEBULÆ.

Right Ascension, Fourteen Hours.

NAME OF NEBULA	Right Ascension.	Declination.
418 Hersc. II. Bootis	14 10 20	+35 58½
Very small and faint : seen with some difficulty.		
99 Hersc. I. Bootis.........	14 12 50	+37 7½
Brighter and larger than the last, but still faint and pale.		
70 Hersc. I. Virginis.......	14 22 30	− 5 22
A very interesting nebula, well and instantly seen, though between an 8·5 and a 10th magnitude star, and close to the former.		
756 Hersc. II. Bootis......	14 54 40	+54 25½
Very poor—seen with difficulty.		

The paucity of objects in the above list is less to be regretted, inasmuch as the light of the June nights is much against their observation. Of the four nebulæ contained in the 14th hour of Right Ascension, but one—the third in our list—possesses any interest. Close to the fourth is a double star, from which a perfectly straight line of smaller stars extends, and which is much more curious than the nebula itself.

THE PLANETS FOR JUNE.

Mercury passes its inferior conjunction with the Sun on the 13th of June: at the beginning of the month it may be seen in the evenings, and towards the end of the month in the mornings. On the 1st of the month it sets about twenty minutes past nine in the evening. It remains in the Constellation of Taurus.

June 1st.	R. A.	5 45 2	Dec. N.	23 16½	Diameter	10″·6.
30th.		5 13 18	-	18 57½	,,	8″·8.

Venus passes from Gemini into Leo during the month, and continues to be the evening Star, becoming daily brighter. It is now admirably situated for observation, not setting until after ten o'clock in the evening.

June 1st.	R. A.	7 29 25	Dec. N.	24 6½	Diameter	15″·4.
30th.		9 41 32	-	15 31	,,	19″·2.

Illuminated portion of Venus 0·657.

Mars is now an uninteresting object: it passes from Gemini into Cancer during the month.

June 1st.	R. A.	7 32 38	Dec. N.	23 6½
30th.		8 47 48	-	19 10½

Jupiter is still a fine object for observation, setting about two o'clock in the morning at the beginning and about midnight at the end of the month. It remains in the Constellation of Virgo.

June 1st.	R. A.	13 7 29	Dec. S.	5 38	Diameter	38″·6
30th.		13 7 43	-	5 47½	,,	35″·8

Saturn is also well placed for observation in the western sky, setting about half an hour before Jupiter, and remaining in the same Constellation. The Ring still continues very narrow.

June 1st.	R. A.	11 59 18	Dec. N.	2 45½	Diameter	16″·4
30th.		12 1 46	-	2 22½	,,	15″·6

Dimensions of Ring—Outer Major Axis, 40″·0, Outer Minor Axis, 2″·2

THE MINOR PLANETS.

The following are the Minor Planets which will be on, or within one hour of Right Ascension on either side of the Meridian, between 9 and 12 o'clock during the evenings of June. Their places are to be found in the Supplement to the Nautical Almanac for 1866.

	Magnitude.		Magnitude.
Pallas	9·2	Polyhymnia	11·1
Metis	9·5	Atalanta	14·2
Psyche	10·8	Harmonia	9·5
Fortuna	10·1	Calypso	12·4
Thalia	11·4	Mnemosyne	11·4
Amphitrite	9·6	Olympia	12·1
Euphrosyne	12·5	Echo	13·3

ASTRONOMICAL OCCURRENCES FOR JUNE, 1863.

DATE.		Principal Occurrences.		Jupiter's Satellites.		Meridian Passage.
		h. m.			h. m. s.	h. m.
Mon	1	 8 49 11 29	Sidereal Time at Mean Noon, 4 37 53·5 Eclipse of the Moon Full Moon			Moon. — 11 59·0
Tues	2	9 38	Conjunction of Mars and Venus, 0° 54′ N.	3d Tr. I. ,, Tr. E.	10 37 13 9	Jupiter. — 8 24·1
Wed	3	11 40 12 46	Occultation, ξ¹ Sagittarii Reappearance of do. (6)			8 20·0
Thur	4			2nd Oc. D. 1st Oc. D.	9 36 11 53	8 16·0
Frid	5	12 46 13 54	Occultation, 8 Aquarii (6) Reappearance of ditto	1st Tr. I. ,, Sh. I. ,, Tr. E. ,, Sh. E.	9 5 10 9 11 19 12 22	8 11·9
Sat	6			2nd Sh. E. 1st Ec. R.	8 57 9 34 49	8 7·9
Sun	7					8 3·9
Mon	8	1 52 12 57	Moon's Last Quarter Occultation Reappearance of 16 Piscium (6)			7 59·9
Tues	9					7 55·9
Wed	10					7 51·9
Thur	11	21 54	Conjunction of Uranus with the Sun	2nd Oc. D.	12 3	7 47·9
Frid	12			1st Tr. I. ,, Sh. I. ,, Tr. E.	10 56 12 4 13 9	7 43·9
Sat	13	4 12	Inferior Conjunction of Mercury	3d Ec. D. 2nd Sh. I. ,, Tr. E. 3d Ec. R. 1st Ec. R. 2nd Sh. E.	9 2 51 9 3 9 12 11 14 32 11 29 18 11 31	7 40·0
Sun	14			1st Sh. E.	8 46	7 36·0
Mon	15	11 19 12 17 12 20 19 36	Conjunction of Uranus and Mercury, 4° 0′ S. Conjunction of Moon and Mercury, 2° 37′ S. Conjunction of Moon and Uranus, 1° 23′ N. New Moon			7 32·1

DATE.		Principal Occurrences.		Jupiter's Satellites.		Meridian Passage.
		h. m.			h. m. s.	h. m.
Tues	16		Sidereal Time at Mean Noon, 5 37 1·9			Arcturus. 8 31·0
Wed	17					8 27·1
Thur	18					8 23.2
Fri.	19	2 56 22 52	Conjunction of Moon and Mars, 5° 50′ N. Conjunction of Moon and Venus, 7° 6′ N.	1st Tr. I.	12 48	8 19·2
Sat.	20			2nd Tr. I. 1st Oc. D. 3d Oc. R. 2nd Sh. I. 2nd Tr. E.	9 7 10 1 10 34 11 37 11 40	8 15·3
Sun	21			1st Sh. I. ,, Tr. E. ,, Sh. E.	8 28 9 29 10 41	8 11·4
Mon	22			2nd Ec. R.	8 45 4	Moon. — 4 39·0
Tues	23	22 22 22 31	Conjunction of Moon and Saturn, 7° 45′ N. Moon's First Quarter			5 22·1
Wed	24					6 6·7
Thur	25	6 41	Conjunction of Moon and Jupiter, 5° 34′ N.			6 53·8
Fri.	26					7 44·5
Sat	27			2nd Tr. I. 3d Oc. D. 1st Oc. D.	11 37 11 45 11 53	8 39·4
Sun	28			1st Tr. I. ,, Sh. I. ,, Tr. E.	9 9 10 24 11 22	9 38·6
Mon	29			2nd Oc. R. ,, Ec. D. 1st Ec. R. 2nd Ec. R.	8 54 9 0 17 9 47 2 11 22 20	10 41·1
Tues	30	18 46	Full Moon			11 44·8

CORRESPONDENCE.

N.B.—We do not hold ourselves answerable for any opinions expressed by our correspondents.

THE COMPANIONS OF SIRIUS.

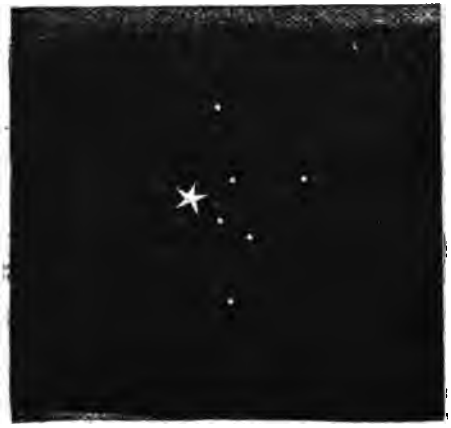
TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—In No. 4, April, of the Astronomical Register, page 57, there is a notice of the discovery, by M. Goldschmidt, of several small Stars in the vicinity of Sirius, besides the one previously discovered by Mr. Alvan Clark. It seems scarcely possible that *some* of these at least should not have been seen with Mr. Clark's magnificent instrument; for on turning upon Sirius my equatoreally-mounted Refractor, of 8¼ inches in aperture, also made by Mr. Clark, I immediately perceived Goldschmidt's Star, called *d*, which is by no means a difficult object; but the condition of the bright Star itself was such as to preclude all hope of discerning anything much nearer to it. The distance of the Star *d* is, however, too great (about 1½′), to make it an object of any particular interest; and the small attendants of such a Star as Sirius form in these latitudes rather a test of the state of the atmosphere than of the quality of the telescope.

I observe that the aperture of Goldschmidt's object glass, which is 46 Paris lines, is stated in the above-mentioned paragraph to be equal to three and five-sixths English inches. This is considerably too small—the true equivalent being 4·085 inches.

Hopefield Observatory, I remain, Sir, yours faithfully,
Haddenham, April 18, 1863. W. R. DAWES.

[The following representation of the six companions of Sirius, as seen by M. Goldschmidt with an inverting telescope, is copied from one given by M. L'Abbé Moigno, in No. 5 of *Les Mondes*. The Star *d* is the uppermost one in the drawing.]



JUPITER'S SATELLITES.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—At 8h. 44m. on Sunday eveniug, the 26th of April, when the 2nd Satellite of Jupiter was occulted by the Planet, a most extraordinary phenomenon took place: the Satellite was distinctly seen to be projected clearly *inside* the limb of Jupiter for near twenty seconds. (Aperture 8 inches, power 250.) Has this ever been noticed before? I have seen this in occultations of Stars by the Moon, but never before with the Satellites of Jupiter. I am, Sir, truly yours,

Highgate Hill, May 5, 1863. W. WRAY.

[We observed the same occultation at Clapton, telescope 4 ft. focus, 3⅜ in. aperture: power 100. Although no projection on the disc was noted, the Satellite seemed to disappear and appear again several times before it was finally occulted by the Planet. *Arago* says, (vol. 2, p. 347.) "It has often been remarked indeed, that a Star before disappearing was projected on the apparent disc of the Moon, and very curiously, this phenomenon, often visible to an able observer furnished with good instruments, was not perceived by an observer situated close beside, and employing a comparatively inferior instrument." The two observations would seem to confirm this.—Ed.]

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—On the 17th instant, about 10h. 15 m., Jupiter being very bright, your notice in the Register for April, as to the visibility of his Satellites by the naked eye, occurred to me, and on observing the Planet carefully I perceived a *small* minute bluish coloured Star on its right side, very much like, when compared with the Planet, the telescopic appearance of the companion of Rigel and that Star.

On referring to the Nautical Almanac, page 476, I found that the first and second Satellites were then close together in the place observed, and presume that it was their combined light which was visible to my eye, which I may add is very sharp, and enabled me when younger to separate ε and 5 Lyræ, to which you also refer.

I do not find any Stars, even of the telescopic magnitudes, laid down in Dick's Atlas to the right of the place of Jupiter for that day and hour, nor, in looking at Jupiter, about 9 p.m., did I observe any in the field of the telescope; my attention, however, was then specially directed to the disc itself.

I endeavoured shortly afterwards to verify my observations with a small opera glass, but the sky had become too hazy, and what I had seen had become imperceptible.

It may interest some of your readers to remark, that on the 1st of June at 9 p. m., the 1st, 2nd and 4th Satellites will be all close together, about the same distance to the left of Jupiter; and on the 2nd, the 1st and 4th very close together on the right: besides which, there are some other similar positions early in June, which may be found by reference to the Nautical Almanac, page 477, or which you may possibly indicate in your own useful and handy work.

I am, Sir, yours respectfully,
W. L. BANKS.

1, Castlebar Road, Ealing,
May 19*th*, 1863.

INSTRUMENTS, &c., FOR SALE.

Applications respecting prices and other particulars to be made to the Editor of this paper—if by letter, enclosing stamp for postage of answer.—These notices are inserted free of charge to Subscribers.

Astronomical Refractor, focal length 4 feet, aperture 3⅜ inches, complete, on a Portable Universal Equatoreal Stand. [3]

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A Copy of the **Bedford Catalogue,** in good condition. [10]

The **Bedford Catalogue.**—A good price will be given for a clean uninjured copy of the Second Volume of the Celestial Cycle. [13]

NOTICES TO CORRESPONDENTS.

Rev. J. W., Beeston.—We could have given the Double Stars in smaller type, but considering the slight amount of light allowable in an observatory, a large type was thought preferable.

J. M. S., Belfast.—An account of the method of working silvered glass specula, by the Rev. H. C. Key, will be found in the 'Monthly Notices' for April last.

The continuation of Mr Burr's Lecture on Celestial Photography is postponed for want of space.

As a publication of this nature is peculiarly liable to errors, we trust our friends will kindly point out any they may detect; and we may add that we shall at all times be most happy to adopt, as far as practicable, any suggestions which may tend to render our pages more intelligible or useful.

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N. B.—Subscribers, whose names or addresses are incorrectly given, are particularly requested to notify the same to the Editor as speedily as possible, in order that they may be corrected in the next impression.

In addition to the above, there are a number of Subscribers whose names are unknown to us, obtaining their copies through the Booksellers: we shall be glad to insert them, upon receiving the necessary information.

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CONTENTS.

Page
Address to our Readers ... 81
Meeting of the Royal Astronomical Society, May 8 ... 82
New Diaphragm for Variable Stars ... 87
The Glasgow Observatory ... 88
The Pleiades ... 89
Eclipse of the Sun ... 89

Notes and Gleanings:

Comet III, 1863——Astronomy, by the Rev. R. Main——Mitchel's Astronomy of the Bible——Colonial Astronomy ... 90
Table of Nebulæ ... 90
Remarks on ditto ... 90
Positions of the Planets ... 91
Astronomical Occurrences for the Month ... 92

Correspondence:

Companions of Sirius——Jupiter's Satellites ... 94
Instruments for Sale, &c., ... 96
To Correspondents ... 97
List of Subscribers ... 97
Advertisements ... 99

LONDON: Private Press—Observatory, Downs Road, Clapton.

The Astronomical Register.

No. 7. JULY. 1863.

Visibility of the Lunar Mountain Aristarchus in the Earth's Shadow during the Total Eclipse of the Moon, June 1st, 1863.—By W. R. Birt, Esq., F.R.A.S.

On the occasion of the lunar eclipse of June 1st, I directed special attention to the visibility of Aristarchus while covered with the earth's shadow. The instrument I used was the Royal Astronomical Society's Sheepshanks Telescope, No. 5. As the shadow approached Aristarchus its brilliancy was considerably impaired, and *very shortly* after the shadow covered it it became quite invisible. When the total phase commenced, and the surface of the moon, turned towards the earth and sun, was involved in shadow, a zone of *twilight* was very distinctly apparent, in which the light was sufficiently strong to manifest, with great distinctness, the Mare Crisium and a portion of the Mare Fecunditatis. This zone of twilight did not extend from the boundary of the earth's shadow just after the commencement of totality much further than the Mare Crisium, and as the totality advanced, and the zone of twilight apparently crept round the northern portion of the moon's disc, the outline of the Mare Crisium became indistinct, and was finally lost about the time of the middle of the eclipse. A little before this the outline of the Mare Frigoris could only be indistinctly traced, the principal or exterior portion of the twilight zone being beyond the moon's disc. After the middle of the eclipse, as the moon approached the portion of the zone on the other side of the shadow, the border of the Occanus Procellarum became apparent, and about 21 minutes before the end of the total phase, Aristarchus became visible, and continued to increase in brightness until the totality was completed. The superior brilliancy of the illuminated portion of the moon's disc considerably impaired the brilliancy of Aristarchus while in the shadow: I was nevertheless able to keep my eye steadily upon it, and although a mere luminous point, as compared with its brightness in the totality, I never lost it, and observed it emerge from the shadow, after which it very soon recovered its brilliancy. It was nearly ten minutes after Aristarchus became visible in the shadow that the outline of the dark spot Grimaldi could be faintly traced.

The northern limb of the moon was exceedingly distinct during the whole of the totality ; but it was with difficulty the southern could be seen, and then only about the middle of the total phase. The colour of the twilight zone was decidedly green, and almost immediately after the commencement of totality the portion of the disc visible in the shadow and viewed with the finder presented the red or coppery colour so often witnessed.

The spots above-mentioned were all I could trace in the shadow. The light near the confines of the shadow was very much greater than the ordinary earth shine, but the obscurity was very great towards the centre of the shadow.

ROYAL ASTRONOMICAL SOCIETY.

Eighth Meeting, June 12th, 1863.

C. B. Vignoles, Esq., F.R.S., *Vice-President,* in the chair.

Secretaries: Rev. C. Pritchard and Mr. Hodgson.

Sixty-one presents were announced, among them a work from Pulkowa on the Great Nebula in Orion, and an engraving of the same object from Harvard Observatory, Cambridge, America.

Archdeacon Garbett was balloted for and duly elected a Fellow of the Society.

The following papers were read :—

"On the Constant of the Moon's Horizontal Equatoreal Parallax," by Mr. Hugh Breen.

"On the Solar Eclipse of May 17th," by Lord Wrottesley. The beginning of the eclipse was lost from clouds, but its progress was observed by Lord Wrottesley and his assistant, with different telescopes. The Moon's limb was seen much jagged.

"On the amount of Light given by the Moon during its greatest obscuration," by the Astronomer Royal. Mr. Airy being near-sighted, compared the Moon as seen by his unassisted eye, with the stars which then appeared as discs and found that the light considerably exceeded Antares, was sensibly greater than Spica, but less than Altair and Lyræ.

A report from Professor Piazzi Smyth stated that neither of the eclipses was seen at Edinburgh.

Mr. Ellis, of Exeter, sent some drawings of the Lunar Eclipse, the Moon's disc being seen of a copper colour, with many of the markings visible.

"On the Planet Mars," by Mr. Lockyer. The drawings made by different observers present a tantalizing want of uniformity, which may be very much accounted for from the distortion produced by the rotation of the planet altering the perspective materially in eight or ten hours. It is therefore necessary to take drawings in several positions as to longitude. At the opposition in last autumn Mr. Lockyer made a complete series, twenty-two in number, of all parts of the planet, which, when compared with those of Beer and Mädler made in 1830, and some by Prof. Phillips, of Oxford, made at the same time as Mr. Lockyer's, agree closely. With Beer and Mädler's drawings, although made with a smaller instrument than Mr. Lockyer's, the similarity is wonderful. All parts that were dark in 1830 are still so, and if the dark portions be water, those which are land-locked are the darkest. Mr. Lockyer's drawings have greater detail, but all are foreshadowed in Beer and Mädler's. The Snow Zone was very brilliant, and the centre not coincident with the pole of rotation: on August 23rd it occupied one-fifth of the diameter of Mars, on September 23rd one-tenth, and on the 11th October only one-thirteenth, after which it increased again. It was so bright as to be seen projected beyond the limb by irradiation, and once could be seen through a cloud which obscured the planet. In one instance Beer and Mädler saw a spot where the author saw only a light shade, and Mr. Dawes also noticed this, and that it was of a greenish tint. With respect to colour, the views of Secchi appear correct, and Prof. Phillips also confirms this. The dark portions are always more or less green, and this when no red is apparent, so that it cannot be contrast. Many transits of clouds belonging to the planet were seen across its disc, which alter the configuration and account for many differences in drawings as they make the dark parts lighter. Besides clouds, a dense atmosphere very much affects the configuration, and a great dissimilarity between some drawings by Mr. Nasmyth, on September 25th and October 11th, and those by Mr. Lockyer of the same date, must be ascribed to this cause. Mr. Lockyer also exhibited a skeleton map of parallels of latitude and meridians, which, being transparent, could be laid over his drawings, and the place of any particular spot thus readily determined.

Mr. Pritchard called attention to the engravings from Prof. Phillips' drawings in the "proceedings of the Royal Society," and protested against their being accepted as truthful representations, the darkness being greatly exaggerated.

Mr. Lassell, being called upon by the chairman, stated he had little to add to Mr. Lockyer's remarks, not having worked much on the planet. He was not surprised to find Beer and Mädler had done so much, as with the planets, large telescopes were not so valuable as might be supposed—the great excellence of the definition in small achromatics allowing all the detail to be seen.

Mr. Hodgson thought the contrast between the polar snow and other parts on some evenings must have been magnificent in large telescopes.

Mr. Lassell said the effect would be quite as striking in a small one.

Mr. Pritchard enquired whether more detail could not be got with the large instrument.

Mr. Lassell. I have drawn what I can see, and I do not imagine all that is found in Prof. Phillips' drawings was visible at one time—some parts could only be seen by glimpses; the exaggerated effect of the engravings is a necessary evil in printing.

Mr. Lockyer was sure the exaggeration was entirely with the printer, as the drawings were strictly comparable with his, which were not at all too sharp.

Mr. Lassell bore testimony to the faithfulness of Mr. Lockyer's drawings, which had even become a little rubbed down.

Mr. Dawes said that the weather had been so bad and his health little better, that he had not done much with Mars. He had, however, examined it several times and made one sketch, which agreed remarkably with Mr. Lockyer's, and was a continuation, as to time, of his observations, showing a permanent black mark which had been partially obscured by clouds while Mr. Lockyer was observing. Mr. Dawes' drawings in 1852, were made when the planet had high north declination—all the dark parts visible then are now well brought out. The north pole was then turned towards the earth as much as the south pole is now, and a comparison of the two sets of drawings might throw light on what are permanent markings. The drawings might be united on a globe. Mr. Dawes observed then, as Mr. Lockyer does now, that portions are often partly covered and at other times distinct, showing the prevalence of clouds.

Mr. Pritchard hoped the meteorology of Mars would not prevent a map being made.

Mr. Dawes had often observed that the dark patches faded towards the circumference, and the edges became white, showing evidently the effect of clouds or atmosphere.

Mr. Lockyer had noticed this was much more evident in the north than in the southern hemisphere of Mars when it was summer. In the south, spots could sometimes be seen up to the edge.

"Occultation of κ Cancri," by Capt. Noble. The star disappeared instantaneously.

The same occultation and same result were reported by Mr. Vertu.

"On the two Eclipses," by Capt. Noble. In the Sun's eclipse it was remarked that the Moon's limb was comparatively smooth. In the lunar eclipse the undefined character of the shadow prevented any time observations, but during the total observation the details were well seen.

"On the Companions of Sirius," by M. Goldschmidt. These were well seen when the star had its best altitude, but at other times by glimpses. He had measured the star *d* in the drawing, but thought the two nearer Sirius more brilliant, and likely to be connected with it.

Mr. Dawes had seen *d*, but thought its visibility more a test of atmosphere in England than of the telescope. There were not three nights in a year on which it would be seen here.

"On Foucault's Apparatus for producing Uniform Motion," by

Col. Strange. This is the apparatus prepared for driving the Great Equatoreal at Paris, and with the clock detached and a driving weight of 58lbs., the time kept was perfect for half an hour, and the weight being reduced one half, the revolutions were equally accurate for another half hour. The apparatus is patented in France and England, and will soon be described by the inventor. The great point is the governor, which is a modification of Watts's.

Capt. Toynbee enquired whether it was applicable to produce an artificial horizon at sea.

Col. Strange. No it is not,—that requires something of a gyroscope to *prevent* motion. This apparatus *produces* uniform motion.

Mr. Pritchard. Did you see a star kept on the wire ?

Col. Strange. No,—the clock was not attached to the telescope, but under a great variation in the weight, the index kept uniform time.

Mr. Lassell. This proves it would keep a star on the wire.

Mr. Carrington thought, if extreme accuracy were desired, appeal would have to be made to an astronomical clock placed under ground so as to have an invariable temperature ; and, if in a case exhausted nearly to a vacuum, alteration, by atmospheric pressure varying, would be obviated. As a controlling power, independent of the moving force, he recommended an escapement, invented by Richard Bond.

"On a remarkable Facula," by Capt. Noble. On the 24th May, between a spot near the Sun's limb and the edge, a long ridge of light, having a thin dark edge, and almost stereoscopic, was seen, of which a drawing was sent.

"On the Solar Spots," by the Rev. F. Howlett. This was the paper commenced at the last meeting, and Mr. Howlett having first presented some photographs of the Solar Eclipse, taken by Prof. Selwyn, recapitulated some of the points formerly mentioned, noticing that the fifty-five sheets of drawings now presented represented eighteen months work, and 120 discs, on the small scale, and 200 spots and groups, much larger. The mode of drawing on a screen was described, and strongly recommended. The spots preponderated in the northern hemisphere in 88 out of 128 discs, and in the south in 43 only, while in the remainder they are about equal. The maximum in number was about 1859 or 60; the minimum may be expected in 1865 or 6. The spots never occur in high latitudes, and the faculæ are seen with great beauty on the screen, placed at four feet from the eye-piece of the telescope. On the screen they may be detected in the centre of the disc, as well as at the edges, and are often seen surrounding spots and looking like a ridge of luminous matter. That this is not an optical illusion may be seen by inspecting Prof. Selwyn's photographs, where it is equally apparent.

Mr. Carrington had seen this effect with Mr. De la Rue's telescope, and came to the conclusion that it was optical, as it followed the shape of the spot, with the corners rounded off.

Mr. Howlett thought the appearance important, as showing the cavernous nature of the spots, like snow swept up, leaving the dark ground in the centre. There is frequently a remarkable persistency in small spots, but the large ones alter rapidly. He adhered to the astronomical theory of the spots, in opposition to Kirchoff's hypothesis, that they are something like clouds, and also drew attention to the vorticose influence pervading many groups, and a series of bifurcations in some, like the unfolding of the great spiral nebula.

Mr. Dawes. Have you seen any rotation of the whole mass of a spot ?

Mr. Howlett. No,—but clouds so often interfere, and the spots change so rapidly. Sometimes the nucleus appears without penumbra, but generally the penumbra comes first. Mr. Howlett noticed the fantastic shape which some of the spots presented, and shewed several extraordinary specimens, which excited much mirth. One group, having a remarkable resemblance to a skeleton, was 158,000 miles long.

Mr. Vignoles, the chairman, in thanking Mr. Howlett, urged the importance of accumulating such observations as tending to elucidate the nature of the Sun's atmosphere.

Mr. Brayley said the analogy between the spots and cyclones was first pointed out by Sir J. Herschel, and drew attention to an arrangement of the spots in many of the drawings meeting at a small angle, which agreed with a similar arrangement of storms on the earth, as shewn by Col. Reid and Mr. Piddington.

In answer to questions Mr. Howlett stated, that there were differences of shade in the spots, black and brown being perceptible, and that the nuclei were often double.

Mr. Carrington, with reference to Mr. Brayley's observations, said the motions he referred to were a necessary mechanical consequence of the motions of fluids on a sphere in rotation, and were common, therefore, to the motion of spots on the Sun and tornadoes on the earth. The great thing wanted was observations of the spots from hour to hour or even from one quarter of an hour to another, instead of from day to day as they are now obtained.

Mr. Howlett suggested, that different observers should take charge of different hours in the day ; and Mr. Dawes thought it singular if rotation of the spots was a necessity that it was so rarely observed.

"On an Eclipse of the Sun at a very early period of history, recorded in the Chinese annals," by Mr. J. Williams, Assistant Secretary. At Mr. Hind's request Mr. Williams had searched for the records of an eclipse earlier than others, and in a certain Chinese book had found the well-known account of some proceedings against two officers who had failed in predicting an eclipse of the sun, and in this book the date could not be ascertained, but in another it was given indirectly, and Mr. Williams, by careful analysis of the Chinese method of reckoning, had found that it occurred in the year 2158, B.C., with a possible error of four years, and that it took place in the part of the heavens occupied by our constellation Scorpio.

The Chairman (Mr. Vignoles) in adjourning the meetings and closing the session, remarked on the variety and interest of the papers brought before them, and, with reference to the curious investigation, by Mr. Williams, of the date of the well-known fact in Chinese history, said it had reminded him and probably would others of the old college verses made on the event, which were he thought as follows :—

Here lie the bodies of Ho and Hi
Whose fate, though sad, was risible,
Being hanged because they could not spy
The eclipse—which was invisible.

Heigh ho ! 'tis said, that being drunk,
Thus brought them into trouble ;
But surely this is incorrect,
As drunken folks see double !

THE ECLIPSE OF THE SUN,

MAY 17th, 1863.

Exposure of sensitive paper during the Eclipse.—The following is part of a letter from Mr. G. W. Wigner :—

"I exposed about 30 sensitive papers, but the action was seriously affected by clouds and vapours. They shew, however, a very marked diminution of the light until 6 h. 32 m. when it increased until 6 h. 46 m., and afterwards again diminished, owing to clouds. The paper used was washed with a solution of iodide of potassium, sensitized with aceto-nitrate of silver, developed with gallic acid, and fixed with hypo-sulphite of soda."

Mr. Wigner kindly sent us the slips of sensitive paper for inspection, with extracts from his notes taken with regard to them ;—they fully bear out the remarks in his communication, and evince great diligence on the part of the observer in making the most of a not very favourable opportunity.

THE ECLIPSE OF THE MOON,

JUNE 1st, 1863.

We have received several communications relating to this occurrence, from which the following are extracts :—

Captain Noble writes :—

"I observed the eclipse on Monday last : accurate determination of times in lunar eclipses is, however, impracticable, and save the marked darkness of the centre of our shadow, nothing especial was noticed."

Mr. G. J. Walker, of Teignmouth, writes :—

"I hope you enjoyed as favourable a view of the eclipse of the Moon as I had here ; the sky was beautifully clear all the time, and I was able to note the times of the principal phases with accuracy, which I imagine is not common in such observations."

Mr. Barber, of Stanton-by-Dale, writes :—

"I had a beautiful view of the eclipse : the shadow on the disc was very finely fringed : there was no sharpness at any point. At some stages it was exactly the colour of some of the albumen photographs—a greenish brown."

NOTES AND GLEANINGS.

Comet III, 1863.—Mr Romberg has forwarded to us the following elements of this Comet, calculated from three observations, Berlin, April 15, Leyton, April 20 and 25:—

$$\begin{array}{llll} T & \multicolumn{3}{l}{1863,\ \text{April}\ 20{\cdot}84356\ \text{G. M. T.}} \\ \pi & 305^\circ\ 53'\ 19''{\cdot}2 & \multirow{2}{*}{\Big\}\ \text{Mean Eq. } 1863{\cdot}0} \\ \Omega & 250\ \ 17\ \ 19{\cdot}3 & \\ \iota & 85\ \ 30\ \ 19{\cdot}0 & \\ \text{Log. } q. & 9{\cdot}798654 & \end{array}$$

Motion—direct.

Mr Romberg says, "I saw this comet last on June 1st, and am not sure whether it can still be observed, in consequence of its low position and the bad weather. The other comet, (II) is still visible as a round nebula with a faint nucleus, and will be observed probably in the month of July."

The Royal Society.—Astronomers will learn with pleasure that Mr J. Russell Hind has just been chosen into this select corporation. The Rev. Canon Stanley is the only other noticeable name.—*English Churchman.*

The Great Silvered Speculum, till lately under the care of M. Chacornac, of the Imperial Observatory, Paris, is at present being provided with a permanent instead of a temporary mounting, and is destined ultimately for Marseilles, where the sky is of a more equable character.—*Note from the Rev. T. W. Webb.*

The Star-finder.—In a note from Mr. Walker, of Teignmouth, he says,—" The Star-finder, or miniature Equatoreal, made by *Horne and Thornthwaite* is a handy little instrument. I have tried the capabilities of it for various purposes,—as finding the time, the longitude, &c.,—and can supply particulars, if required."

Visitation of the Royal Observatory.—The annual inspection of the Royal Observatory by the Visitors officially appointed for that purpose took place on Saturday last, the 6th instant. In his report, Professor Airy speaks with satisfaction of the good order of the instruments of the Observatory generally, and reviews the labours of the past year, which relate principally to subjects of a technical character. Of subjects of more general interest, it appears that he has commenced a series of observations on star spectra—a branch of physical inquiry which of late has attracted great general interest, and which may yet lead to most important results. He states also that, from observations of the planet Mars compared with other observations made in Australia, a value of the solar parallax has been obtained " exceeding the received value by about 1-24th part." It is also mentioned that a new determination of the direction of movement of the solar system in space has been made, taking into account a very large number of stars (above 1,000), the result of which investigation supports the deductions already obtained by other astronomers. The Visitors were scarcely so numerous as usual, which may be accounted for by the very unsettled state of the weather.

THE PLANETS FOR JULY.

Mercury rises about three o'clock in the mornings at the beginning of the month, and is then pretty well situated for observation. It passes from Taurus to Cancer during July.

July 1st.	R. A. 5 15 9	Dec. N. 19 8	Diameter	8″·4.
31st.	· 8 29 17	- 20 39	,,	5″·0.

Venus is becoming daily more brilliant—setting shortly after nine o'clock in the evening. It passes from Leo to Virgo.

July 1st.	R. A. 9 45 37	Dec. N. 15 7	Diameter	19″·6.
31st.	11 32 7	- 1 49	,,	27″·4.

Illuminated portion of Venus 0·519.

Mars passes from Cancer into Leo during the month, but is now almost entirely out of sight.

July 1st.	R. A. 8 50 20	Dec. N. 19 0
31st.	10 4 22	- 13 1½

Jupiter remains a brilliant object in the south-west sky—setting about midnight at the beginning and about ten o'clock at the end of the month. It remains in the Constellation of Virgo.

July 1st.	R. A. 13 7 53	Dec. S. 5 49	Diameter	35″·6
31st.	13 17 33	- 6 56	,,	32″·6

Saturn remains in the same Constellation, and much the same relative position with regard to Jupiter as during last month.

July 1st.	R. A. 12 1 56	Dec. N. 2 21	Diameter 15″·6
31st.	12 9 31	- 1 26	

Dimensions of Ring—Outer Major Axis, 38″·0. Outer Minor Axis, 2″·5

THE MINOR PLANETS.

The following are the Minor Planets which will be on, or within one hour of Right Ascension on either side of the Meridian, between 9 and 12 o'clock during the evenings of July. Their places are to be found in the Supplement to the Nautical Almanac for 1866.

	Magnitude.
Ceres	8·1
Pallas	9·2
Metis	9·7
Fortuna	10·0
Thalia	11·4
Euterpe	10·6

	Magnitude.
Amphitrite	9·4
Fides	11·1
Calypso	12·8
Echo	13·1
Hesperia	12·9

ASTRONOMICAL OCCURRENCES FOR JULY, 1863.

DATE.		Principal Occurrences.		Jupiter's Satellites.		Meridian Passage.
		h. m.			h. m. s.	h. m. a Ophiuchi.
Wed	1		Sidereal Time at Mean Noon, 6 36 10·2	3d Sh. E.	9 11	10 50·7
Thur	2	13 34 13 41 14 41	Occultation τ^1 Capricorni Reappearance of do. (6) Near approach of Moon to τ^2 Capricorni (5)			10 46·8
Frid	3					10 42·8
Sat	4					10 38·9
Sun	5	1 2 15 21 16 34 15 26 16 28	Conjunction, Uranus and Mercury, 3° 20′ S. Occultation of 9 Piscium Reappearance of do. (6) Occultation of κ Piscium Reappearance of do. (4½)	1st Tr. I.	11 3	10 34·9
Mon	6	19 39 23 46	Greatest Westerly Elongation of Mercury, 21° 2′ Conjunction of Venus and Regulus, 8m·3 W.	2nd Oc. D. ,, Oc. R. ,, Ec. D. 1st Ec. R.	8 57 11 30 11 37 50 11 41 39	10 31·0
Tues	7	10 28	Moon's Last Quarter	1st Sh. E.	9 1	10 27·1
Wed	8			2nd Sh. E. 3d Sh. I.	8 31 10 47	10 23·1
Thur	9	14 11 14 58	Occultation, π Arietis (5½) Reappearance of do.			10 19·2
Frid	10					10 15·3
Sat	11					10 11·4
Sun	12	21 26	Conjunction of Moon and Uranus, 1° 33′ N.			10 7·4
Mon	13	0 0 16 19	Conjunction of Venus and ρ Leonis, 6m·4 W. Conjunction, Moon and Mercury, 0° 51′ N.	1st Oc. D.	10 9	10 3·5
Tues	14			1st Sh. I. ,, Tr. E. ,, Sh. E.	8 43 9 40 10 56	9 59·6
Wed	15	10 54	New Moon	2nd Tr. E. ,, Sh. I. 3d Tr. I. 2nd Sh. E.	8 33 8 39 9 30 11 5	9 55·6

DATE.		Principal Occurrences.		Jupiter's Satellites.		Meridian Passage.
		h. m.			h. m. s.	h. m.
Thur	16		Sidereal Time at Mean Noon, 7 35 18·6			*a* Ophiuchi. 9 51·7
Fri.	17	22 31	Conjunction of Moon and Mars, 6° 29′ N.			9 47·8
Sat.	18					9 43·8
Sun	19	18 51	Conjunction of Moon and Venus, 5° 36′ N.			9 39·9
Mon	20	13 42	Greatest Easterly elongation of Venus, 45° 36′			9 36·0
Tues	21	7 40	Conjunction of Moon and Saturn, 7° 24′ N.	**1st** Tr. I. „ Sh. I.	9 23 10 39	Moon. — 4 3·9
Wed	22	17 5	Conjunction of Moon and Jupiter, 5° 8′ N.	**2nd** Tr. I. **1st** Ec. R.	8 37 9 59 34	4 49·0
Thur	23	9 32	Moon's First Quarter			5 36·8
Fri.	24			**2nd** Ec. R.	8 33 0	6 28·1
Sat	25					7 23·5
Sun	26			**3d** Ec. D.	8 57 54	8 22·5
Mon	27	1 45 8 3	Conjunction of Venus and *τ* Leonis, 0m·8 E. Ditto, 0° 7′ N.			9 24·3
Tues	28	9 0 10 7	Occultation, ξ^1 Sagittarii Reappearance of do. (6)			10 26·8
Wed	29			**1st** Oc. D.	8 30	11 28·1
Thur	30	8 29 9 20 1 33	Occultation, 8 Aquarii (6) Reappearance of ditto Full Moon	**1st** Tr. E. „ Sh. E.	8 3 9 15	*a* Ophiuchi. — 8 56·6
Fri.	31			**2nd** Oc. R. „ Ec. D.	8 48 8 49 23	8 52·7

CORRESPONDENCE.

N. B.—We do not hold ourselves answerable for any opinions expressed by our correspondents.

JUPITER'S SATELLITES.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—In your last number a correspondent notices a recent instance of the appearance of one of Jupiter's Satellites on the disc of the planet, although it was at the time passing *behind* the planet, and should (it was expected) have been occulted thereby. May I be permitted to draw attention to an equally remarkable phenomenon mentioned in that most interesting work, Webb's "Celestial Objects for Common Telescopes," p. 125. [Edition of 1859.] After mentioning the appearance of a shadow of Sat. iv., *twice as great in diameter* as the Satellite which cast it; and that of two shadows being attended by faint duplicates of themselves, he proceeds:—"But the most surprising is a phenomenon which requires, and possesses, the highest attestation. 1828, June 26, II.," [the same Sat. noticed by your correspondent and yourself,] "having fairly entered on Jupiter, was found 12 or 13 m. afterwards *outside the limb*, where it remained visible for at least 4 m., and then suddenly vanished. The authority of such an observer as Smyth would alone have established this wonderful fact; but it was recorded by two other very competent witnesses, Maclear at 12 miles and Pearson at 35 miles from Smyth at Bedford." And in a note he adds, "Gambart says that at the immersion of I., 1823, Oct. 19, 'le Satellite a disparu et reparu plusieurs fois.'"

I have often thought, with thankfulness, that such wonderful facts as these disarm objection to the miracles recorded in Joshua x., and 2 Kings xx.

I am sir, truly yours,

Croydon, *June* 16*th*, 1863. G. B. H.

ADMIRAL SMYTH'S "CELESTIAL CYCLE."

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—I observe, in a recent number of your excellent Journal, an advertisement that a copy of the work is wanted by some one,—permit me here to suggest, with hopes that it may fall under the notice of the gallant admiral whose name we all so respect, that a new edition of this most interesting and valuable work would confer a great boon on Astronomers of the present generation. Twenty years have nearly elapsed since the first edition was issued, and it is now out of print. A new edition, in harmony with the advanced state of science, would be of inestimable value to the multitudes of amateurs who, like myself, are unprovided with and unable to obtain copies. I am, sir, your obedient servant,

June 20*th*, 1863. X. Y. Z.

THE PLANET MARS.

Mr. Joynson presents his compliments to the Editor of the "Astronomical Register," and would be obliged by his replying to his correspondent, that the power used when observing "Mars" last year was 370, and not 170.

He cannot reply to the question, whether or not the power is "excessive," but may remark that the eye-piece was made, as also the object-glass itself, by Messrs. T. Cooke & Sons, of York, and has a very large field and excellent definition.

Liverpool, 8th June, 1863.

[Mr. Joynson's attention has only just been called to this matter by a friend.]

THE SATELLITES OF SATURN.

On this subject we have had one or two communications, shewing the want of an ephemeris by which to distinguish and determine the places of these interesting objects.—One correspondent says :—

"It would add much to the utility of the 'Astronomical Register' if it contained the places of Saturn's Satellites during the time of the planet's being conveniently visible, in the same way as Jupiter's Satellites are given in the 'Nautical Almanac.'"

Another correspondent writes :—

"Is there any generally available mode of identifying the five old Satellites of Saturn? As they can be reached by the glasses in possession of many, to indicate how they may be distinguished might be acceptable. *Titan*, of course, can generally be known."

NOTICES TO CORRESPONDENTS.

As a publication of this nature is peculiarly liable to errors, we trust our friends will kindly point out any they may detect; and we may add that we shall at all times be most happy to adopt, as far as practicable, any suggestions which may tend to render our pages more intelligible or useful.

We have to apologise to our Subscribers for the delay which has in some instances occurred in the appearance of the Register. We do all we can to get it out in good time, but must entreat their forbearance until the extension of the Subscription list warrants us in going to a greater expense in its production.

Our lists of Double Stars and Nebulæ, with several other communications, are unavoidably postponed for want of space.

ERRATUM.—Page 82, line 11, for *Bohn* read *Baume.*

THE ASTRONOMICAL REGISTER.

List of Subscribers.

◆

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CONTENTS.

Page

Mr Birt, on the Lunar Eclipse, June 1st 101

Meeting of the Royal Astronomical Society, June 12 102

Eclipse of the Sun 107

Eclipse of the Moon 107

Notes and Gleanings :

Comet III, 1863——The Royal Society——The Great Silvered Speculum——The Star-finder——Visitation of the Royal Observatory ... 108

Positions of the Planets 109

Astronomical Occurrences for the Month 110

Correspondence :

Jupiter's Satellites——Smyth's Celestial Cycle——The Planet Mars ——The Satellites of Saturn 112

To Correspondents 113

List of Subscribers 113

Instruments for Sale, &c., ... 114

Advertisements 115

LONDON: Private Press—Observatory, Downs Road, Clapton.

The Astronomical Register.

No. 8. AUGUST. 1863.

CELESTIAL PHOTOGRAPHY.

[*Continued from page* 68.]

We are now enabled to resume our abstract of Mr. Burr's Lecture on this subject, left unfinished in the May number of the "Astronomical Register."

Passing from the consideration of the pictures taken of the Moon, it was stated that Mr. De la Rue had also photographed the double star Castor, by means of his reflecting telescope, and the planets Jupiter and Saturn. It was very remarkable, that although coming from such an immense distance to the earth the rays from Jupiter possessed so much actinic power that the planet's picture could be obtained in the same time as sufficed for taking that of the Moon, viz. from five to twelve seconds, although its light was evidently not more than one-third that of the Moon, as could be seen when they were in contact during occultations. Saturn usually required a minute's exposure, but in a picture taken at an occultation both Saturn and the Moon were well seen, the time occupied in photographing them having been fifteen seconds only. The Lecturer then proceeded to notice the progress made in photographing the Sun, and mentioned that in consequence of a suggestion of Sir John Herschel in 1856, a telescope had been constructed especially for the purpose, by the late Mr. Ross, and mounted equatoreally, with a clock-work movement. This instrument was called the photo-heliograph, and had been for some years used daily when the weather permitted at the Kew Observatory for obtaining pictures of the Sun's disc. It had since been removed to Mr. De la Rue's Observatory at Cranford, but was now returned to Kew. The object-glass was 3·4 inches in aperture and 52 inches focal length. It was corrected so that the actinic and visual foci were coincident, but as an eye-piece was used to amplify the image on the collodion plate, this coincidence became slightly deranged, and the sensitive plate had to be placed a little beyond the visual focus. The Sun's disc was magnified to four inches in diameter, and in consequence of the intensity of the light, coloured glasses, dry plates and retardation of the chemicals were employed at first to prevent solarization, but ultimately recourse was had to dispensing with the driving-clock and taking the pictures instantaneously by means of a shutter with a slit in it, pulled downwards by an india-rubber spring, and held up by a thread until the right moment for taking the picture, as indicated by the Sun in the finder touching a wire, when the thread was set on fire, allowing the Sun's light to flash momentarily through the slit as the shutter passed through the focal point, and the picture was taken. A series of examples of the action of this instrument was exhibited, and it was also stated that Mr. De la Rue had recently been attempting to procure pictures of the spots with his own reflecting telescope on the large scale of thirteen feet for the Sun's diameter, of which attempts some specimens were shown, as also of the results of the application of Herr Pretsch's process for printing from photographs, by which portions of the Sun's disc and the spots thereon had been obtained depicted on copper plates absolutely untouched by the graver, and capable of being printed with ordinary letter-press.

By combining pictures of the Sun, taken at intervals of a few days in the stereoscope, a globular effect was produced as in the case of the Moon.

The most important use of the photo-heliograph had, however, been to obtain photographs of the Total Solar Eclipse of 1860. For this purpose it had been taken to Spain by Mr. De la Rue and his assistants, forming part of the celebrated Himalaya Expedition, and with the instrument, when mounted at Rivabellosa, near Miranda del Ebro, a number of pictures of the partial eclipse, and two of the totality had been obtained—the latter being allowed a minute exposure for each, and the telescope driven by the clock motion. These photographs and the subsequent measurements and discussion to which they had been subjected showed conclusively that the red prominences seen round the edge of the Moon's body, during a total solar eclipse, belonged to the Sun and not to the Moon, or our atmosphere, as had sometimes been affirmed. The full details of this most important and interesting application of photography to Astronomy have been given by Mr. De la Rue in the Bakerian Lecture for 1862, recently published, and of which we gave a notice in our number for February.

Through the kindness of Mr. De la Rue, the Lecturer was enabled to exhibit by the lime-light lantern the photographs of the totality, taken from the original negatives, as shown at the Royal Society on the occasion of the delivery of the Bakerian Lecture, with a selection from the phases of the partial eclipse, and views of the temporary Observatory at Rivabellosa, and the surrounding scenery. Copies of five photographs of the totality, taken by Father Secchi, at Desierto de las Palmas, near Valencia, on the Mediterranean Coast of Spain, 240 miles distant from Mr. De la Rue's station, were also exhibited, and, although on a much smaller scale, being taken with a 9-inch refractor without an eye-piece to magnify the image, fully confirmed the deduction that the prominences belonged to the Sun. This part of the Lecture was also diversified by the exhibition of a series of interesting views of the country, from Bilbao, across the Pyrenees, photographed by Mr. Thornthwaite, and shown by the lantern on the 9-foot disc.

Among the heavenly bodies to which photographic processes had been applied were Comets, and it was a remarkable fact, that while Astronomers with both reflectors and refracting telescopes had failed in 1858 and 1861 to obtain any trace whatever of the magnificent Comets of those years, a gentleman, named Usherwood, of Walton, in Surrey, about the 26th September, 1858, succeeded in taking a small picture of Donati's Comet, about an inch in length, with an ordinary portrait camera and seven seconds exposure, without any driving machinery whatever. An enlarged positive from this negative was exhibited, and the Lecturer having also referred to the photographic operations of the Rev. Professor Selwyn, who, at Ely, has for upwards of a year photographed the Sun at every available opportunity, and produced a most valuable series of pictures, and also called attention to the extraordinary application of photography to depicting the Stellar Spectra, which had been accomplished by Mr. Huggins and Dr. Miller for the stars Sirius and Capella, concluded with some remarks on the structure of the Moon, illustrating the analogy between the Lunar Craters and the Peak of Teneriffe, by magnified photographs of drawings of lunar mountains, by Secchi and Nasmyth, as compared with the stereoscopic views, taken by Professor Piazzi Smyth during his expedition to Teneriffe.

THE TREVANDRUM OBSERVATORY.—We are sorry to hear that the enlightened Rajah of Travancore has ordered this well-known and useful Observatory to be dismantled. No cause is assigned. The late observer, Mr. Allan Brown, has received a retiring pension.

GREAT VARIATION OF TEMPERATURE LAST MONTH.—In a note to the *Times* Mr Lowe notices that on the 11th of July the thermometer recorded 87°·2 in the shade, adding that so high a point has not been reached for four years: this is confirmed by Mr Burder; while Mr Plant mentions that by the 14th it had fallen to 37°·5, and a letter from Reading states that on the morning of the 18th it stood at 30°·0, and that the grass was crisp and white with frost.

On a method of referring the appearances of lunar objects to intervals of the luni-solar day.

By W. R. Birt, Esq., F.R.A.S.

In my paper* entitled "Plato" (being reminiscences of a visit to Hartwell, in April and May, 1863) I allude to a mode of referring the appearance of objects on the lunar surface to certain portions of the luni-solar day: for example, a certain object is illuminated from sun-rise to sun-set, and undergoes various apparent changes during the presence of the sun above its horizon; if it be a mountain, casting a well-defined shadow towards the *east* in the forenoon, shining with a more or less brilliant aspect in mid-day, the shadow appearing again, but in an opposite direction, in the afternoon. If the moon's axis were perpendicular to the ecliptic, each object would present *nearly the same* aspect at the same period of the luni-solar day; but if the axis were inclined, a difference in the direction of the shadows and a corresponding difference in the aspect of the object, would necessarily result. As the moon's axis is inclined 1° 30′ these differences occur, and it is clear that if the moon's age only were employed, even when computed to hundredths of a day, as a means of specifying the epochs of certain appearances, the effect of libration would so extensively interfere with the expression of consecutive phases as to render such a mode of reference useless. Not so the duration of sun-light upon the object, whether the day be long or short—whether the season be summer or winter, all the changes from the recess of the shadows at early morning to the lengthening of them towards evening will be completed during the presence of the sun above the horizon, consequently the division of the duration of sun-light into 100 equal parts allows of a ready and convenient reference of every aspect to the corresponding portion of the luni-solar day. In order to facilitate the computation of the duration of sun-light upon certain portions of the moon's surface, the Astronomer Royal has kindly furnished me with formulæ, which I have employed in determining the period at the spot "Plato," for the lunation April to May, 1863, or, more accurately, for a point determined by the co-ordinates 7° east long and 51° north latitude on the moon. The interval between sun-rise and sun-set being 357 h. 28 m., the sun rising at the spot on April 25 d. 21 h. 4 m. and setting on May 10 d. 18 h. 32 m.,—the hundredth part of this interval is 3 h. 34 m. 28s·8, which is the value in time of each degree of illumination. This method of designating the successive aspects of a lunar object, appears to be preferable to referring them to the moon's age—as they must be strictly consecutive, and at any given degree of illumination in successive lunations the appearances will be so nearly alike, being modified only by the slight alterations in the position of the sun dependent on the inclination of the moon's axis, that the aspect will be known by giving the degree of illumination : as instances, the two following appearances of Plato are given, one at sun-rise, the other at sun-set. In both instances the shadows are apparent on the floor of the crater.

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* Of this paper (printed only for private circulation) there are a few copies still remaining. I shall be happy to forward copies to gentlemen interested in lunar physics.

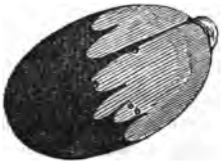

Fig. 1.

Plato, sun-rise, Rev. W. R. Dawes, 1863, April 26 d. 8 h. ±. Degree of illumination, 0·03.

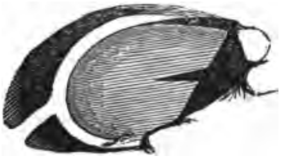

Fig. 2.

Plato, sun-set, W. R. Birt, 1863, May 10 d. 15 h. 56 m. Degree of illumination, 0·99.

It is intended to obtain sketches of the Crater Plato if possible for each degree of illumination, so as to present them in a consecutive series.

Victoria Observatory, Sewardstone Road West,
Victoria Park, London, N.E.

CORRESPONDENCE.

N.B.—We do not hold ourselves answerable for any opinions expressed by our correspondents.

EFFECTS OF ATMOSPHERE.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—I trouble you with a few lines on the importance to meteorological science of attention being paid to different states of atmosphere, as not only causes of refraction, but as diminishing the light and changing the colour of the heavenly bodies.

For several evenings past, after days of sultry heat, the light of the sun has become sufficiently subdued, when at an altitude of 10°, to enable me to observe the solar spots, without any protection for the eye, through a 3-inch achromatic. Towards 7, p. m., the sun has changed from a dazzling white to a deep yellow, then to a crimson, then to a coppery red, then to a dark brown, and has finally been lost in a thick haze. I attribute these effects (most marked on the 13th, 14th, and 15th of the present month), partly to the presence of aqueous vapour, with perhaps snow, in some north-westerly region of the atmosphere, and partly to carburetted and sulphuretted exhalations ; the smoke of London rising between the sun and my position.

And this may perhaps explain why the eclipsed moon of the 1st of June appeared of a coppery red to town observers. To me it appeared of a pale blue, with a tinge of green, suggesting the idea of a smooth globe of ice. In this case I was looking away from London towards the south, through a perfectly clear atmosphere; but from the same place of observation, which is situated on the elevated table land of the chalk downs above Wrotham, where I am living; 700 feet above sea level.

The progress of this eclipse I watched with great interest. I had expected the moon to become extinct, and was surprised by the somewhat sudden apparition of a pale phosphorescent moon, when, by theory, the obscuration should have been greatest. I noticed also a bright spot on the darkest part of the moon, which I at first suspected might be a lunar volcano, but afterwards saw sail away from the edge, as a small star. The star was fairly projected on the moon's disc; and this and the moon's appearance at the time were clear cases of refraction; but whether as arising from the earth's atmosphere or the moon's it would be hard to determine. That the moon has no proper or phosphorescent light of its own seems certain, from the fact that we see nothing of it at the end of its monthly lunations, when the moon eclipses itself (so to speak), by turning its back on the sun; but is still there in the heavens, with the same face towards us.

Fairseat, Wrotham, Your obedient Servant,
July 18*th*, 1863. W. E. HICKSON.

PLANETARY NEBULA IN DRACO.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—I beg to call the attention of your readers to Herschel's planetary nebula, No. 37, in Draco, situated between Zeta and Delta of that constellation, and close to the pole of the Ecliptic.

I was looking at the nebula a few nights ago with my reflector of 12-inch aperture, having silvered glass specula, and perceived very near to its centre and deeply immersed in the pale blue nebulosity, a small star of the tenth magnitude, or thereabouts. On referring to Admiral Smyth's 'Cycle' I found he describes the nebula as "a bright pale blue object," but makes no reference to any star. I have not the means of knowing in what manner it was described by Sir Wm. Herschel, its discoverer; but it would be singular if the star was then as visible as it is now, that he should have missed it. I see it best with a power of 110, and the largest possible aperture. I hope this may meet the eye of some of your numerous readers, who may possess instruments of great calibre so as to verify my observation, and detect any peculiarity in the object which my instrument will not reveal, and not hitherto observed.

I am, Sir,
Key Hill, Hockley, Birmingham, Yours faithfully,
July 16*th*, 1863. FREDERICK BIRD.

OCCULTATION OF A STAR DURING THE LUNAR ECLIPSE.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—Can you inform me of the name and magnitude of a small fixed star whose occultation—disappearance and reappearance—occurred during the totality of the last eclipse of the Moon? The Nautical Almanac gave no intimation of the occurrence, and so far as I have seen, no observer has mentioned it in any printed report of the phenomenon. I am, Sir,

Knightsbridge, July 8. Yours, &c., R. T. L.

JUPITER'S SATELLITES.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—I confess my inability to arrive at the same conclusion as your correspondent G.B.H. from the phenomena exhibited by the second satellite of Jupiter. I certainly imagined that everybody, not actually under restraint, was satisfied that the singular appearances detailed in the works referred to were simply optical illusions: and assuming this to be the case, am utterly at a loss to conceive how they can "disarm objection to the miracles recorded in Joshua X. and 2 Kings XX." The first mentioned miracle is given ostensibly on the authority of a book, written, as is supposed, at least 400 years after the date of that narrating it, (vide 2 Samuel, I. 18); and in common with the last must stand or fall—as a *miracle*. If it should have been an optical illusion, there is an end of its miraculous character: if on the other hand it should have been a miracle, it can receive neither confirmation nor illustration from a mere visual deception. "Utrum horum mavis accipe." I am, Sir,

Obediently yours, N.

THE BEDFORD CATALOGUE.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—In reply to your correspondent X.Y.Z., (page 112 of No. 7), and in answer to various inquiries as to my *Cycle of Celestial Objects*, I am happy to announce that another edition of the work is in preparation, by a very capable and experienced friend. This gentleman is first re-examining all the stars and nebulæ contained in the Cycle, with a powerful achromatic telescope of 9½ inches aperture, most efficiently mounted, as a necessary prelude to printing.

The proposed work will also embody the later observations contained in the *Speculum Hartwellianum.*

I am, Sir, &c., W. H. SMYTH.

St John's Lodge, 3, 7, 63.

VARIABLE STARS.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—I send you a few notes of some stars which have appeared to me with more or less probability to be variable—perhaps some who are more particularly engaged in this sort of observation may think it worth while to look at them. I am, Sir, Yours, &c.,

Teignmouth, July 16, 1863. G. J. WALKER.

STARS SUSPECTED OF BEING VARIABLE.

Taurus—213 P. III.—Smallest component marked 12th mag. by Smyth, seems 9th or 10th.—See *Webb.*

Pisces—65.—Both seem equal in magnitude.—See *Webb.*
(My observations coincide with Webb's remarks on the above.)

Serpens—39.—The large star 6 or 6½ instead of 7½, as marked.

Leo—7 }
Virgo—44 } Both small components seen so readily that there may be room to suspect variability.

Aquila—250 P. XIX.—I should have reckoned the component marked 14th as of the 10th magnitude. Repeatedly observed: once compared with the component of 302 P. XVIII., it seemed of equal size.

Lacerta—16.—The smallest star marked 15th magnitude appears 12th or 13th.

NOTES AND GLEANINGS.

Newly-named Planets.—Planet 75, discovered by Dr. Peters, of Clinton, F.S.A., in Sept. last, has received the name of Eurydice: his planet, discovered in November the name of Frigga (than which an uglier and more barbarous one could scarcely have been found),—we believe it is of Teutonic mythological origin. Its similarity with Freia (76) is not the least objection which may be urged against it.

It is really much to be wished that planet-namers would be more discreet: we are already overburdened with names objectionable on the score of likeness of sound and orthography, and as exemplifications of human vanity, evidenced by the choice of Eugenia, Angelina, Maximiliana, &c. Can popular opinion not be brought to bear to enforce adherence to the accepted rule of ancient female deities? There are plenty of them remaining unappropriated,—*e. g.* Clio, Terpsichore, Polyxena, Iphigenia, Medea, Camilla, Andromache, Arethusa, Electra, Clymene, Alecto, &c. &c.

The Zodiacal Light.—In a communication to *Silliman's American Journal*, Major Hunt, of Key West, states that he has repeatedly assured himself of seeing shadows cast by the zodiacal light.

Congress of Astronomers.—The congress which met last year at Dresden, will hold their sittings for the present year, on August 27th, and two following days, at Heidelberg. M. Schönfeld, of Mannheim, is the honorary secretary.

Stellar Parallax.—M. Krüger, of Bonn, has published in the *Astronomische Nachrichten* the result of his enquiries for parallax on the stars, 21,258 of Lalande's Catalogue, and 17,415 of Oeltzen's Zones. For the former he gives 0·260″, with a probable error of + 0·02″; and for the latter 0·247″, with a probable error of 0·021″. From this it appears that those two stars, both telescopic, are nearer to us than Polaris Arcturus, and Sirius.

"**Observations on the Solar Spots**, made at Redhill Observatory," is the title of a work, by Mr. R. C. Carrington, in preparation by Williams and Norgate.

New Catalogue of Standard Stars.—Part I, of Vol. IV, of the Harvard Observations has just reached England. It contains a refined catalogue of standard stars, selected from the best catalogues, by T. H. Safford. The right ascensions of 152 stars are given for 1855, with copious constants for reduction.

A New Variable Star.—On the night of the 20th of May last, Mr. N. R. Pogson, the government astronomer at Madras, observed a star of the ninth magnitude on a spot in the constellation Scorpio, where no star had been seen in the months of April and May during the last nine years. At first it was supposed to be one of the minor planets, but a series of micrometrical measures of its position with respect to other stars near it, made the same night, established its fixity, and revealed its true character. On the following night it was decidedly less bright, and by the 28th it had diminished to less than the twelfth magnitude. Strong moonlight then interfered with the observations, but on the night of June 1st, during the darkness caused by the total eclipse of the moon, it was again looked for, but was no longer visible. Only three other stars are known, discovered respectively by Mr. Hind, Mr. Baxendell, and Herr Auwers, whose appearances and disappearances take place so suddenly; and every addition to the list of objects so remarkable is regarded with considerable interest by astronomers. Mr. Pogson calls his new variable U Scorpii, and its place for 1860·0 is, right ascension 16h. 14m. 26·6s.; declination 17° 33′ 36″ south.

THE PLANETS FOR AUGUST.

Mercury will at the latter end of August be well situated for observation in the evenings. The Planet passes from Cancer to Virgo during the month.

August 1st. R. A. 8 38 0 Dec. N. 20 11½ Diameter 4″·8.
31st. 11 39 15 S. 0 26½ ,, 5″·4.

Venus is now a magnificent object in the evenings, arriving at its greatest brilliancy on the 23rd of the month. It remains in the Constellation Virgo, setting about nine o'clock at the beginning and about seven at the end of August.

August 1st. R. A. 11 35 5 Dec. N. 1 22 Diameter 28″·0.
31st. 12 35 17 S. 10 8½ ,, 43″·0.
Illuminated portion of the disc of Venus 0·325.

Jupiter can be seen in the western sky during the first part of August, but is too near the Sun for favourable observation. It remains in Virgo.

August 1st. R. A. 13 18 1 Dec. S. 6 59 Diameter 32″·4
31st. 13 35 8 - 8 46½

Saturn also is now too near the Sun to be observed with advantage; it continues in the same Constellation as Jupiter.

August 1st. R. A. 12 9 50 Dec. N. 1 23½
31st. 12 21 6 - 0 6½
Dimensions of Ring—Outer Major Axis, 36½″. Outer Minor Axis, 3″·0

Uranus is now coming into view again, and can be seen at the latter end of the month. It will be favourably situated for observation in September.

August 1st. R. A. 5 32 14 Dec. N. 23 24½
29th. 5 36 47 - 23 27½

THE MINOR PLANETS.

The following are the Minor Planets which will be on, or within one hour of Right Ascension on either side of the Meridian, between 9 and 12 o'clock during the evenings of August. Their places are to be found in the Supplement to the Nautical Almanac for 1866.

	Magnitude.		Magnitude.
Ceres	8·1	Amphitrite	9·5
Pallas	9·3	Fides	10·9
Flora	8·5	Leda	11·6
Fortuna	10·1	Echo	13·3
Massilia	9·9	Angelina	11·1
Lutetia	9·5	Maximiliana	11·4
Thalia	11·7	Hesperia	12·8
Euterpe	10·5		

ASTRONOMICAL OCCURRENCES FOR AUGUST, 1863.

DATE.			Principal Occurrences.	Jupiter's Satellites.		Meridian Passage.
		h. m.			h. m. s.	h. m. Altair. —
Sat	1	17 39	Conjunction of Mars and Regulus, 7m·5 W. Sidereal Time at Mean Noon, 8 38 23·5			11 4·0
Sun	2	11 3 18 49	Near approach of Moon to 22 Piscium (6) Superior Conjunction of Mercury	3d Oc. D.	7 48	11 0·0
Mon	3					10 56·1
Tues	4					10 52·2
Wed	5	22 5	Moon's Last Quarter			10 48·2
Thur	6			1st Tr. I. " Sh. I.	7 47 8 58	10 44·3
Frid	7	13 11 14 7	Occultation of ω² Tauri Reappearance of ditto (5½)	1st Ec. R. 2nd Oc. D.	8 17 32 8 58	10 40·4
Sat	8					10 36·4
Sun	9	6 8	Conjunction of Moon and Uranus, 1° 49′ N.	2nd Sh. E.	8 7	10 32·5
Mon	10					10 28·6
Tues	11					10 24·6
Wed	12					10 20·7
Thur	13			3d Sh. E.	9 4	10 16·8
Frid	14	2 3	New Moon			10 12·8
Sat	15	10 3 16 55	Conjunction, Moon and Mercury, 6° 49′ N. Conjunction, Moon and Mars, 6° 28′ N.	1st Sh. E.	7 34	10 8·9

DATE.		Principal Occurrences.		Jupiter's Satellites.		Meridian Passage.
		h. m.			h. m. s.	h. m.
Sun	16		Sidereal Time at Mean Noon, 9 37 31·8	2nd Sh. I. „ Tr. E.	8 15 8 32	Altair. — 10 5·0
Mon	17	0 52 17 44 18 20	Conjunction of Saturn and Venus, 6° 14′ S. Conjunction of Moon and Saturn, 7° 0′ N. Conjunction of Moon and Venus, 0° 38′ N.			10 1·1
Tues	18	10 12	Conjunctiou of Mars and Mercury, 0° 3′ N.			9 57·1
Wed	19	5 11	Conjunction of Moon and Jupiter, 4° 31′ N.			9 53·2
Thur	20					Moon. — 4 23·6
Fri.	21	1 36 18 20	Conjunction of Mercury & Sigma Leonis, 9m·5 E. Moon's First Quarter			5 16·1
Sat	22	15 0	Greatest brilliancy of Venus	1st Sh. I. „ Tr. E.	7 16 8 28	6 11·9
Sun	23			2nd Tr. I.	8 43	7 10·5
Mon	24					8 10·5
Tues	25			2nd Ec. R.	8 18 7	9 10·6
Wed	26	10 53 11 58	Near approach of Moon to τ^1 Capricorni (6) Ditto to τ^2 Capricorni (5)			10 9·3
Thur	27	15 26 16 12	Occultation, c^1 Capricorni (6) Reappearance of ditto			11 5·9
Fri.	28	8 55 13 29 14 16	Full Moon Occultation, κ Aquarii (5) Reappearance of ditto			12 0·4
Sat.	29	11 0 15 52 16 45	Near approach of Moon to 9 Piscium (6) Occultation of 16 Piscium Reappearance of do. (6)	1st Tr. I.	8 14	Altair. — 9 13·9
Sun	30					9 9·9
Mon	31	8 35	Conjunction of Saturn and Eta Virginis, 8m·3 W.	3d Ec. R.	6 56 25	9 6·0

TABLE OF NEBULÆ.

Right Ascension, Eighteen Hours.

NAME OF NEBULA	Right Ascension.	Declination.
6 Struve N. Tauri Poniatov.	18 5 35	+ 6 49½
A very small but extraordinarily bright planetary nebula.		
17 M. Clypei Sobieskii ...	18 11 25	−16 15½
A large and rather bright mass of flocculent aspect, lying somewhat across the field of view.		
28 M. Sagittarii............	18 16 15	−24 56½
Tolerably bright, and condensing towards the centre, with faint signs of resolvability.		
22 M. Sagittarii............	18 28 0	−24 0½
A large and relatively bright nebulous mass, shewing traces of resolvability.		
57 M. Lyræ	18 32 20	+38 39
A most wonderful bright ring of light: its interior *very* faintly nebulous.		

The number of Nebulæ in the 18th Hour of Right Ascension is small, but this is compensated for by the great interest attaching to them. The first object on our list, 6 Struve N. Tauri Poniatovii, is so minute as to appear with a low power simply as a star out of focus; it is however so brilliant as to bear any amount of amplification, and to shine brightly under the highest powers. 17 M. Clypei Sobieski is the so called 'Horse shoe,' or *Greek Omega* nebula; with any moderate instrument however it will be seen as a flocculent mass, lying rather N.P. and S.F. across the field of view. Our next two objects, 28 and 22 M. Sagittarii, are relatively bright, considering their proximity to the horizon: under favourable circumstances they show signs of resolvability, but are certainly not fairly resolved. Our last nebula, of which it may be well said that "*Finis coronat opus,*" is one of the most curious objects in the heavens: it presents the appearance of a solid ring of light, suspended in an interesting field of stars. In the instrument employed the middle of this ring is certainly lighter than the surrounding sky; but in any smaller one, say of less than 4 inches aperture, this effect would doubtless be lost, and the ring appear as though the opening through it were perfectly black.

The Lord Chief Justice on *Astrology and Astronomy*: Zadkiel's Almanac.—"Of all the strange delusions that ever misled the mind of man, the notion that our destinies are affected by the combinations of stars is perhaps the strangest. Ancient Astronomers had affixed for convenience certain names to particular stars, borrowing those names from heathen mythology; and then Astrologers had actually in their ignorance ascribed to the stars the characters of those deities whose names they bore: and then because one bright star was called Venus, and another of a more fiery red was called Mars, they fancied that persons born 'under' those stars had the characteristics of those particular heathen deities. Nothing could be more absurd, and such was the sort of rubbish with which this almanac was filled."—*Times*, June 30.

[Nearly a million copies of *Astrological* publications are stated to be sold annually in this country alone: can we not obtain a small fraction of this circulation for an *Astronomical* Paper?—Ed.]

INSTRUMENTS, &c., FOR SALE.

Applications respecting prices and other particulars to be made to the Editor of this paper—if by letter, enclosing stamp for postage of answer.—These notices, which are restricted to *three lines* each, are inserted free of charge to Subscribers.

Astronomical Refractor, focal length 4 feet, aperture 3⅜ inches, complete, on a Portable Universal Equatoreal Stand. [3]

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THE ASTRONOMICAL REGISTER.

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N. B.—Subscribers, whose names or addresses are incorrectly given, are particularly requested to notify the same to the Editor as speedily as possible, in order that they may be corrected in the next impression.

NOTICES TO CORRESPONDENTS.

We are again compelled to postpone several communications for want of space.——The letter from G.F.C. in our next.

As a publication of this nature is peculiarly liable to errors, we trust our friends will kindly point out any they may detect; and we may add that we shall at all times be most happy to adopt, as far as practicable, any suggestions which may tend to render our pages more intelligible or useful.

INSTRUMENTS FOR SALE: *NOTICE.*—It has been suggested that a readier sale might be obtained for the instruments if an account, more detailed than there is space for in the present list, with prices, &c., were given: we have determined therefore, at a charge of one shilling, to insert, for those gentlemen who desire it, an advertisement similar to those following this notice, not to exceed six lines, or about 72 words. Particulars of the instruments, with postage stamps for the amount, to be sent to the Editor not later than the 20th of the month.—The advertisement may be extended at the rate of *2d.* for every twelve words beyond six lines, and when repeated, one half the charge only will be made.

The following Instruments have been advertised for sale during the past month:——

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CONTENTS.

Page
Mr Burr's Lecture on Celestial Photography 117
The Trevandrum Observatory 119
Great Variation of Temperature last month 119
On Lunar Illumination, by Mr Birt 120

Correspondence:

Effects of Atmosphere—Planetary Nebulæ—Occultation during the Eclipse—Jupiter's Satellites 122
The Bedford Catalogue 123
Variable Stars 123

Notes and Gleanings:

Newly named Planets—Zodiacal Light—Congress of Astronomers—Stellar Parallax—Solar Spots—Catalogue of Stars—New Variable Star 124
Positions of the Planets 125
Astronomical Occurrences for the Month 126
Table of Nebulæ 128
The Lord Chief Justice on Astrology and Astronomy 128
Instruments for Sale, &c., ... 129
List of Subscribers 130
To Correspondents 130
Advertisements 131

LONDON: Private Press—Observatory, Downs Road, Clapton.

The Astronomical Register.

No. 9. SEPTEMBER. 1863.

INFERIOR CONJUNCTION OF VENUS.

The Planet Venus will pass her inferior conjunction with the Sun on the 28th of the present month (September.) Unfortunately her altitude will be too small for very favourable observation : it is in the spring that the conjunction can be seen to the greatest advantage. Nevertheless it is desirable that no chance should be thrown away of confirming certain appearances which have been noticed at former conjunctions, and improved instruments and means may enable diligent observers to accomplish what has hitherto been difficult or impossible.

On this occasion Venus will be about eight degrees below the Sun : and those who possess powerful instruments should observe her daily, so as to ascertain how nearly she can be viewed up to and after her conjunction. These observations having to be made in the day time, and under the brilliant light of the Sun, it will be necessary to take the same precautions for avoiding glare as during a solar eclipse. Dr Dick insisted on the possibility of observing planets close to the Sun, and Dr Drew gives an account (Monthly Notices, xv, p. 79,) of his observations of Venus at inferior conjunction. In the latter case however the planet was more favourably situated, but as before remarked, if the conjunction cannot be seen at the present time, it will be well to observe the planet as near as possible to the Sun, both before and after that occurrence.

One observation to be made is with respect to the *twilight* on the planet, by which the cusps or horns of the crescent are considerably elongated beyond what is due to an exact semicircle. To this circumstance also is attributed the fact of the breadth of the illumination on Venus exceeding what should be the case if no refraction existed on the planet. Dr Drew found the excess to be about 2″·0. The measure of the distance of the cusps, and the breadth of the illumination, by means of the micrometer, would be not only useful, but an interesting observation: the diameter of the planet, given in the Nautical Almanac, is 59″·0.

Another point worthy of notice is the appearance of the *dark body* of Venus, resembling that of the Moon when a few days old. This phenomenon, sometimes called the "phosphorescence of the dark side," although repeatedly observed, is not satisfactorily accounted for. It was seen by Mr Berry of Liverpool on the 14th of January of last year, an account of which is communicated to the "Monthly Notices" by Mr Knott. It was also observed about the same time by Mr Gaunt of Stoke Newington. Detailed observations of this appearance, with particular notes as to the state of the atmosphere at the time, are very desirable.

Although, as before remarked, the opportunity cannot be called favourable, yet on the chance that something may be done, we append a few figures, giving the meridian passage and declination of the planet for a short time before and after conjunction.

Date.	Meridian Passage.	Declination South.	Date.	Meridian Passage.	Declination South.
Sept. 10	1h. 19m. P.M.	11° 57′	Sept. 25	11h. 58m. A.M.	10° 41′
11	1 15	12 1	26	11 52	10 24
12	1 10	12 5	27	11 47	10 8
13	1 5	12 7	28	11 39	9 50
14	1 0	12 7	29	11 33	9 31
15	12 55	12 7	30	11 27	9 11
16	12 48	12 5	Oct. 1	11 21	8 50
17	12 44	12 1	2	11 16	8 29
18	12 39	11 56	3	11 10	8 8
19	12 33	11 49	4	11 4	7 46
20	12 28	11 41	5	10 58	7 24
21	12 22	11 32	6	10 53	7 3
22	12 16	11 21	7	10 47	6 41
23	12 10	11 9	8	10 42	6 19
24	12 4	10 55	9	10 37	5 58

For those who do not possess Equatoreals, the above table will point out the position of the Planet at meridian passage: all they require is, to "know their meridian," so as to direct the telescope due south, and to have a means of raising the instrument to the required altitude.*

---

* To find the Altitude of Venus at meridian passage :—Deduct the latitude of the place of observation from 90°; this gives the altitude of the Equator: the declination of Venus, (being South,) taken from this will give the altitude of the planet.

The Occultation of Kappa Cancri by the Moon's Dark Limb, April 26, 1863.

◆

A note communicated to the Royal Astronomical Society by the Rev. W. R. Dawes, (Monthly Notices, Vol. XXIII, p. 221,) respecting the occultation of Kappa Cancri by the Moon on the 26th of April last, as observed by Mr R. Copeland near Manchester, (in which it is stated that "three-fourths of the light disappeared before the remaining portion,") has elicited several remarks, and we have thought it might be useful to bring the various observations together.

Mr Copeland's Telescope is by *Cooke & Sons*, 5 inches in aperture.

Captain Noble, at Maresfield, observing with an instrument by *Ross*, 4⅛ in. aperture, observes—"I can only say that as seen here, Kappa Cancri retained its intrinsic brightness up to the very instant of the Moon's covering it." Power 115. (M.N., p. 251.)

Mr Burr, at Highbury, with a telescope of 3⅜ in. aperture, also by Ross, says—"The star Kappa Cancri disappeared instantaneously." Power 123. (M.N., p. 221.)

Mr Vertu, at Nottingham, with a 3½ inch, by *Troughton & Simms*—"The star, which I followed until in contact with the Moon's edge, disappeared instantaneously." Power 84. (M.N., p. 252.)

And the Editor of this paper, observing with a telescope the same size and make as Mr Burr's, remarks—"The occultation was sharp and instantaneous." Power 100. (M.N., p. 217.)

Mr Dawes, considering that Mr Copeland's observation pointed to the duplicity of the star, examined it with his 8½ inch refractor and powers of 620 and 1000, but perceived neither separation nor elongation. We may add, however, that Mr Vertu records the fact that the *lumière cendrée* was so unusually strong, that although the Moon was 8·8 days old, the circle was sharply defined, and even some features of the dark part visible.

CORRESPONDENCE.

◆

N. B.—We do not hold ourselves answerable for any opinions expressed by our Correspondents.

JUPITER'S SATELLITES.

◆

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—Your correspondent N. has mistaken my meaning: let me assure him that I receive the miracles of Holy Scripture as *miracles*, and have no wish to refer them to the operation of general laws.

My object was to suggest, in the case of the phenomena alluded to, the application of a well known argument, intended, not to confirm miracles, but to answer those who bring objections to them based on physical science. I am not therefore placed in the dilemma he supposes, in which however I see nothing very terrible.

His reference to the *Book of Jasher* is not more formidable. The old supposition that it was a collection of records, written in various ages, is supported by the Syriac version of Jos. X. 13, where it is called *Sephro d'theshbokhtho*, the "Book of Praises," or "Hymns." But is the authority of the Book of Joshua dependent on the age of that of Jasher? I am, Sir,

August 7, 1863. Your obedient servant, G. B. H.

SO-CALLED "MIRACULOUS PHENOMENA."

◆

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—I do not wonder that your correspondent "N." should feel the statement of G. B. H., contained in your No. for July, concerning some exceptional and seemingly anomalous cases of occultations of stars, by the Moon, and eclipses of Jupiter's Satellites; as inconsistent alike with the dignity of revelation and science.

I wish to add a somewhat kindred case, which will shew that this investure of the marvellous is not so very uncommon.

Not long ago, two letters appeared in Saunder's Newsletter (a Dublin daily paper,) both of which were headed "The miraculous cross on the Moon:" should the heading not have been the words of the writer, he should have disclaimed it in his second letter; but he quotes with seeming favour a book lately brought out, entitled "Come Hither," and as the author of that publication regards the cross as miraculous, (or I should say seems from this correspondent's letter to do so), we may, I think, conclude, that this gentleman takes the same view.

In the second letter we are told that this miraculous phenomenon is described in vol. III, of the Proceedings of the Royal Irish Academy: on turning to that volume I find, at page 18, mention made of a "remarkable phenomenon of Paraselene seen in Dublin."

And at page 103, "Dr. Lloyd read a letter from W. Chetwode, esq., describing a remarkable Lunar Halo Paraselene, seen on the night of 21st May, 1845.

Prof. Allman, on the next page, describes it as "a halo and paraselene."

As far as I can see, these gentlemen never even implied that there was any thing "miraculous" in a phenomenon, so closely resembling those often seen in arctic regions. Thus, as delicately as I can, I have tried to expose what I conceive to be an error.

I could say a great deal more; in fact, I find considerable difficulty in leaving out much I might have said, and dealing as lightly with those I conceive to be misinformed, as I hope they would do to me, were I to fall into error.

I am, Sir, truly yours,
Belfast, 18*th August,* 1863. JOHN M. STOTHARD.

THE AUGUST METEORS.

◆

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—On Monday evening last, at 10 h. 14 m. a brilliant meteor appeared in the south, which was distinctly seen to pass over a black cloud and vanish at an altitude of 16°, leaving behind it a luminous trail, upwards of 10° in length, which lasted for at least 20 seconds. This streak of light could be seen on the face of the cloud. The motion of this meteor was in a S.S.W. direction. Shortly after, a small shooting star, second magnitude, passed quickly over the face of the cloud. At 10 h. 50 m. a meteor, brighter than Arcturus, passed over the cloud so as to appear projected upon it. The fact of these bodies having passed between the earth and the cloud shews that their proximity to the surface of our planet must have been very considerable. Thinking the circumstance might interest some of your readers, I have ventured to trespass on your valuable space.

I remain, sir, yours obediently,
August 13. SIDNEY B. KINCAID.

OBSERVATION OF METEORS.

◆

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—At this time of the year, prolific in meteors, might it not be a benefit to many amateurs who are anxious to ascertain their longitude, if notice of the position and time of disappearance of some such meteors were sent to you for publication in your interesting and useful periodical, by those who are in possession of their longitude accurately or approximately: giving of course that longitude in their communications.

This practise, enjoined by Sir J. Herschel and others, has seldom, I believe, been adopted, except amongst a few amateurs here and there, almost privately; but through your Register it might be more general.

If for ten minutes only, on a clear evening, those amateurs who know, and those who wish to know, their longitude, would use their observatory clocks to ascertain accurately the local times of disappearance of meteors, several might be noted, and the comparisons made by means of your periodical, in a short column, thus:—

Date	Place	Local Mean Time of Disappearance	Longitude of Observer
Aug. 17	2° ·5 of Arcturus	9h. 32m. 7s·4	1° 7′ 3″ W.

I am, Sir,

August 13. Your obedient servant, TIME & SPACE.

ASTRONOMICAL FACTS AND FIGURES.

◆

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—I wish some of our great arithmetical mathematicians would bring out a compendious manual of Astronomical Facts, Figures, and Formulæ, something like Baily's well known work, or Bessel's *Fundamenta.* Baily's book is necessarily rather out of date, and quite out of print: our various leading books are full of discrepancies in numerical quantities, and it is extremely difficult to get at the truth, as I have frequently found by experience.

A publication of the kind I suggest, even if it were merely in the form of a broadsheet for suspension, having the imprimatur of such men as Messrs Airy, Hind, or Adams, would meet an undoubted want. I am, Sir,

July 17, 1863. Your obedient servant, G. F. C.

THE PLANETARY NEBULA IN DRACO.

◆

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—I observed the nebula 37 Hersc. IV., to which Mr Bird calls attention, on the 1st of August, and saw, *with high magnifying powers*, a stellar nucleus —or 9·10 magnitude star near its centre. I examined it with powers from 424 to 791: with *lower* powers the small star speck was lost in the extraordinary brilliance of the nebula. It appeared to be not quite circular, and the star not quite, but very nearly, in the centre. Faithfully yours,

Woodcroft, Cuckfield, Aug. 12. G. KNOTT.

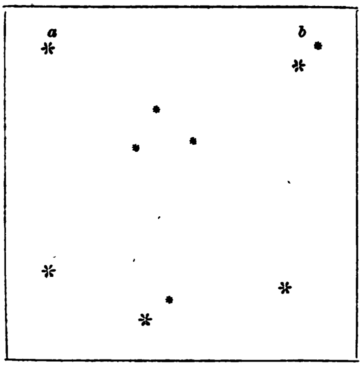
OCCULTATION OF A STAR DURING THE LUNAR ECLIPSE.

◆

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—The enquiry of your correspondent R. T. L. respecting the name and magnitude of a small star occulted during the last eclipse of the Moon, will probably be definitely answered by some one better furnished with means for observing than myself: I may say however that I perceived seven stars at one time in close vicinity to the Moon; at 10h. 35m·5, G.M.T. I saw a star of about the 8th magnitude close to the Moon's south pole; at 10 53·7, when total obscuration had just taken place, I saw three other stars; at 11 16·8 another large star was visible on the south limb, and two faint stars to the left below it; at 11 25·5, seven stars were visible near the Moon.

On the 25th June I tried to find again these stars, and I think I succeeded: I found a group placed about as follows:—



As well as I could judge by the maps of the S.D.U.K., the first star (*a*) observed near the Moon's south pole was 157 *Scorpii*, 8th magnitude; and the second, (*b*), the larger of the two, 15 *Ophiuchi*, 7th magnitude: the boundary line of the constellations passing between these two stars, both of which, as we as some of the others, were probably occulted at places not far from this.

I am, Sir,
Teignmouth, August 7. Yours faithfully, G. J. WALKER.

THE BEDFORD CATALOGUE.

◆

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—Admiral Smyth's letter in the last number of your publication must, I am sure, have aroused a feeling of unmixed pleasure in the minds of all professional as well as amateur Astronomers; his statement also, that the observations contained in the Speculum Hartwellianum are to be embodied in the new edition of the Bedford Catalogue, will add not a little to the desire universally felt for the possession of a copy of this new issue. I must acknowledge that a feeling of excitement, akin to impatience, has been awakened in me by the perusal of Admiral Smyth's letter, and I hope he will confer on us a further favour by informing us *when* we may expect the re-publication of a work which has already been so much approved.

I remain, sir, obediently yours,
Liverpool, *August* 12, 1863. W. G.

THE PLANETS FOR SEPTEMBER.

Mercury will be an evening Star during the month of September, and is pretty well situated for observation at the beginning of the month; it sets shortly after seven in the evening on the first, and a little before six at the end of the month.

Sept. 1st.	R. A.	12 4 16	Dec. S.	1 8½	Diameter 5″·6.
30th.		13 32 30	„	13 36½	,, 8″·8.

Venus although arriving at its greatest magnitude this month, will have too much southern declination to be very well placed, excepting for those who have the means of day observation. Both Venus and Mercury remain in the Constellation Virgo during September.

Sept. 1st.	R. A.	12 35 55	Dec. S.	10 23½	Diameter 44″·4.
30th.		12 2 18	„	9 10½	,, 58″·8.

Illuminated portion of the disc of Venus 0·058.

Jupiter and **Saturn** are now too near the Sun to be favourably observed.

Uranus rises about half-past 10 on the 1st, and a quarter to nine on the 30th. It is in the Constellation Taurus.

Sept. 2nd.	R. A.	5 37 14	Dec. N.	23 28.
30th.		5 38 47	-	23 29½.

Neptune is also well situated for observation, passing the Meridian about midnight at the end of the month.

Sept. 2nd.	R. A.	0 22 8	Dec. N.	0 46.
30th.		0 19 24	-	0 28.

THE MINOR PLANETS.

The following are the Minor Planets which will be on, or within one hour of Right Ascension on either side of the Meridian, between 9 and 12 o'clock during the evenings of September. Their places are to be found in the Supplement to the Nautical Almanac for 1866.

	Magnitude.		Magnitude.
Ceres	8·4	Fides	11·1
Flora	8·1	Leda	11·4
Massilia	9·6	Nemausa	10·9
Lutetia	9·4	Angelina	10·8
Proserpine	11·2	Maximiliana	11·3
Euterpe	10·6	Hesperia	13·2

EXTRACTS FROM LETTERS.

As a variety of useful suggestions and enquiries are contained in the letters of our numerous correspondents, we shall occasionally give extracts from the same, not printing the letter as a whole, unless it is on some specified or particular subject.—This page of our Register may therefore be headed

SUGGESTIONS & ENQUIRIES.

◆

MAP of the MOON.—**A desideratum seems to be a Map of the Moon for ready use by the side of the telescope. Beer and Mädler's smaller map, though very good, is rather too shaded and full of detail for night work. I lately made one from it, a quarter of the size, yet having every place named in Beer and Mädler, and in Webb's maps, which I think I shall find more useful for the purpose of identifying places at night. I know not if such a map could be cheaply multiplied by Photozincography.—G. J. W.**

CONNECTION of ASTRONOMY and METEOROLOGY.—**There are several astronomical questions to which I am giving serious attention, and which cannot be well studied without considering their meteorological relations :—viz. (1) What is there in the Sun's position to account for the great heat of the *dog days* as contrasted with that of the summer solstice? (The received explanation of the earth's accumulation of caloric not being to my mind satisfactory.) (2) What is there in Lunar positions (i. e. as suspected now by Admiral Fitzroy) to account for atmospheric disturbances? (3) What test can be furnished by the thermometer placed in the sun, *with the Sun at equal altitudes*, of the correctness of our calculations of the Sun's apogee and perigee? for a difference of 3,000,000 miles of distance must make some difference in the solar rays. (4) Whether there are not reasons for believing that the influence of the Sun's polar and equatorial diameters are different, from the force of its axial rotation.—All the Sciences are correlated, and none more so than Astronomy and Meteorology; especially since the discovery that meteorolites are bodies projected into our atmosphere from a distance.—W. E. H.**

NOTES AND GLEANINGS.

◆

COMET II, 1863.—M. Oppolzer of Vienna has just published the following ephemeris of Klinkerfue's Comet:

	R. A.	Decl.	Log. Dist.	Brightness:
	h, m. s.	° ′	from Earth	July 15=1
Sept. 1	11 39 29	+56 18	0·4781	0·36
4	11 41 18	56 18	0·4815	
8	11 45 7	56 21	0·4855	
12	11 48 58	56 27	0·4890	
16	11 52 51	56 36	0·4921	
20	11 56 46	56 49	0·4946	
24	12 0 43	57 5	0·4968	0·27

WINNECKE'S COMET OF SHORT PERIOD.—The following ephemeris is extracted from the "Monthly Notices" for June last:—

Date.	R. A.	Decl.	Date.	R. A.	Decl.
Nov. 2	15h. 9m.	−13° 23′	Dec. 4	18h. 10m.	−23° 46′
6	15 29	15 5	8	18 34	24 12
10	15 49	16 43	12	18 59	24 24
14	16 11	18 17	16	19 23	24 21
18	16 34	19 44	20	19 47	24 4
22	16 57	21 2	24	20 10	23 34
26	17 21	22 9	28	20 33	22 53
30	17 45	23 4			

By Dr Seeling's elements this comet should arrive at perihelion on the 23d of November.

Astronomy in the Middle Ages.—We read in *Galignani*, that a work by King Alphonso X, of Castile, has been re-printed and presented to the Academy of Sciences. It is divided into 16 parts, commencing with a catalogue of the fixed stars. He then treats of the apparatus and instruments necessary for observing the stars and *estrellas movediros* or planets. Speaking of the constellations, he says, of Ursa Major, "some astronomers have taken it for a wain with its pole, others say it has the form of an animal, which might as well be a lion, a wolf, or a dog, as a male or female bear. Here then are heavenly animals inhabiting that part of the sky where this constellation is to be found, and recognized by ancient astronomers, because they saw four stars in a square, and three occupying a right line. They must have been endued with a better eye-sight than ours, and the sky must have been very clear. Since they say it is a she-bear, let it be one. They were very lucky in being able to distinguish it.—Times, *August* 13*th.*

Observatory at Toulouse.—The first volume of the "Annales de l'Observatoire de Toulouse" has just been published. M. F. Petit, the director, gives a chapter on the influence of the Pyrenees ; also on the seconds pendulum ; and certain remarks on the lighting of streets, with reference to crepuscular phenomena. The volume also contains a variety of meteorological observations.

The Periodic Meteors generally observed in the month of August have made their appearance as usual, and have been repeatedly noticed by observers. We have several letters on the subject, and others have been sent to the newspapers. The two following, however, may suggest to gentlemen, that they should be very certain that what they see *are* meteors, before they "write to the Times :"—

"TO THE EDITOR OF THE TIMES."

Sir,—A large meteor was seen to-night at 8·27 moving very slowly along the northern horizon from west to east, at an altitude of about 8 deg. It was at least three times as brilliant as Venus, remaining visible for nearly five minutes, moving slower than any hitherto observed. I should be glad to receive observations made at more favourable stations. * * * *

I remain, sir, your obedient servant,
Mr. Slater's Observatory, Euston Road, THOMAS CRUMPLEN.
August 10*th.*

"TO THE EDITOR OF THE TIMES."

Sir,—The "large meteor," seen by Mr. Crumplen on Monday evening at 8·27, three times as brilliant as Venus, and moving from west to east, was a fire balloon sent up shortly after 8 o'clock from the Eton and Middlesex Cricket-ground, Primrose Hill, as a finale to some athletic sports which had taken place during the afternoon.

I am, sir, your obedient servant,
St. John's Wood, *August* 12*th.* B. C. C.

ASTRONOMICAL OCCURRENCES FOR SEPTEMBER, 1863.

DATE.		Principal Occurrences.		Jupiter's Satellites.		Meridian Passage.
		h. m.			h. m. s.	h. m. βAquilæ
Tues	1		Sidereal Time at Mean Noon, 10 40 36·7			9 6·5
Wed	2	13 33	Occultation disappearance of 53 Arietis (6)			9 2·6
Thur	3					8 58·7
Frid	4	13 9 22 46	Moon's Last Quarter Conjunction, Saturn and Mercury, 3° 41′ S.			8 54·7
Sat	5	14 46	Conjunction of Moon and Uranus, 2° 7′ N.			8 50·8
Sun	6			1st Oc. D.	7 23	8 46·9
Mon	7	23 28	Conjunction, Venus and Mercury, 6° 0′ N.	1st Tr. E. ,, Sh. E. 3d Oc. R.	6 57 7 47 7 49	8 42·9
Tues	8					8 39·0
Wed	9	17 22	Occultation disappearance of Kappa Cancri (5)			8 35·1
Thur	10					8 31·2
Frid	11					8 27·2
Sat	12	16 42	New Moon			8 23·3
Sun	13	10 24	Conjunction, Moon and Mars, 5° 44′ N.			8 19·3
Mon	14	5 14 7 32 23 32	Conjunction of Moon and Saturn, 6° 39′ N. Conjunction of Moon and Venus, 4° 30′ S. Conjunction of Moon and Mercury, 0° 49′ N.	1st Tr. I.	6 44	8 15·4
Tues	15	13 33 19 17	Greatest Easterly elongation of Mercury, 26° 28″ Conjunction, Moon and Jupiter, 3° 51′ N.	1st Ec. R.	6 47 40	8 11·5

DATE.		Principal Occurrences.		Jupiter's Satellites.		Meridian Passage.
		h. m.			h. m. s.	h. m.
Wed	16	 20 33	Sidereal Time at Mean Noon, 11 39 45·0 Conjunction, Saturn and Venus, 11° 20′ S.			βAquilæ — 8 3·6
Thur	17	6 45	Occultation disappearance of ι^1 Libræ, (4½)	2nd Tr. I.	6 26	7 59·7
Fri.	18					Moon. — 4 7·4
Sat	19					5 4·1
Sun	20	1 33 9 23	Moon's First Quarter Occultation disappearance of 14 Sagittarii (6)			6 2·2
Mon	21					7 0·3
Tues	22					7 57·5
Wed	23			1st Sh. E.	6 5	8 53·1
Thur	24	1 30	Conjunction, Mars and Venus, 10° 9′ S.			9 47·0
Fri.	25			3d Sh. I. „ Tr. E.	6 39 6 43	10 39·4
Sat.	26	6 50 7 45 18 2	Occultation, 22 Piscium(6) Reappearance of ditto Full Moon			11 31·0
Sun	27					βAquilæ — 7 24·3
Mon	28	6 43 8 36	Occultation reappearance of Pi Piscium (6) Inferior Conjunction of Venus			7 20·4
Tues	29	15 49 16 30	Occultation Pi Arietis (5½) Reappearance of ditto			7 16·5
Wed	30			1st Sh. I.	5 47	7 12·5

TABLE OF DOUBLE STARS,

Right Ascension, Twenty Hours.

CLASS I.—Division 1.

Stars from the 1st to the 7th Magnitude,
From 20" to 180" apart.

Name of Star, &c. Magnitudes & Distance.	Position Angle.	Right Ascension and Declination.	Remarks.
o^2 Capricorni		20 22 10	
6—21"·8—**7**	240	−19 2	

CLASS I.—Division 2.

Stars from the 1st to the 7th Magnitude,
From 8" to 20" apart.

Name of Star, &c. Magnitudes & Distance.	Position Angle.	Right Ascension and Declination.	Remarks.
γ Delphini		20 40 25	
4—12"—**7**	273	+15 38½	

CLASS I.—Division 3.

Stars from the 1st to the 7th Magnitude,
From 3" to 8" apart.

Name of Star, &c. Magnitudes & Distance.	Position Angle.	Right Ascension and Declination.	Remarks.
26 P. xx. Antinoi.........		20 5 40	
6½—3"·5—**7**	211	+ 0 28	

CLASS II.—Division 1.

Stars from the 7th to the 11th Magnitude,
From 20" to 180" apart.

Name of Star, &c. Magnitudes & Distance.	Position Angle.	Right Ascension and Declination.	Remarks.
12 P. xx. Antinoi.........		20 4 20	
8—54"—**9**	202	− 0 32	
43 P. xx. Aquilæ		20 7 35	
8½—44"—**8½**	12	+ 6 10½	
o^2 Cygni		20 9 20	
4—107"—**7½**	174	+46 20	
α^1 Capricorni		20 10 30	
4—43"—**9½**	222	−12 57½	
σ Capricorni		20 11 35	
5½—54"—**10**	177	−19 32½	
29 M. Cygni		20 19 10	
8—55"—**11** (in cluster)	300	+38 4½	
140 P. xx. Antinoi......		20 20 30	
7½—60"—**8**	191	− 2 33½	

TABLE OF NEBULÆ.

Right Ascension, Twenty Hours.

NAME OF NEBULA	Right Ascension.	Declination.
16 Hersc. IV. Delphini ... A pale indifferently defined disc.	20 16 20	+19 40½
103 Hersc. I. Delphini ... A moderately bright mass, without much sign of condensation.	20 27 35	+ 6 58
72 M. Capricorni .... Very faint and pale; seen as a slight mist on the dark background of the heavens.	20 46 0	−13 2
1 Hersc. IV. Aquarii...... A beautifully bright planetary nebula of pale blue tint, shewing a bright disc even with the highest power.	20 56 50	−11 53½

Of the Nebulæ in the 20th Hour of Right Ascension, the fourth in the list is by far the most interesting. The first and second call for no special remark—the third, 72 Messier Capricorni, will require some attention, (and an eye totally free from all stimulus of artificial light,) to see it at all. 1 Herschel IV. Aquarii is very beautiful and curious; the extraordinary contrast between it and 16 Herschel IV. Delphini will cause some surprise in the mind of the observer, that two such very dissimilar objects should be both included in the category of Planetary Nebulæ.

VARIABLE STARS.

NOTICE.—With our next number we shall present to our readers a copy of a valuable pamphlet by G. Knott and J. Baxendell, Esqrs, (printed for private circulation,) on the "*Method of Observing Variable Stars.*"

NOTICES TO CORRESPONDENTS.

N. B.—It is requested that in all cases where particulars of observations are forwarded for publication, the *focal length* and *aperture* of the instrument, and the *power* used may be stated.

A Notice of Professor C. P. Smyth's paper on the Elchies Telescope in our next.——Some other communications are also deferred.

THE ASTRONOMICAL REGISTER.

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N. B.—Subscribers, whose names or addresses are incorrectly given, are particularly requested to notify the same to the Editor as speedily as possible, in order that they may be corrected in the next impression.

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CONTENTS.

Page
Inferior Conjunction of Venus ... 133
Occultation of Kappa Cancri, April 29 ... 135
Correspondence :
  Jupiter's Satellites—So called Miraculous phenomena—The August Meteors—Observation of Meteors—Nebula in Draco—Astronomical Facts and Figures—Occultation during the Lunar Eclipse—The Bedford Catalogue ... 135
Positions of the Planets ... 139
Extracts from letters—Suggestions and Enquiries :
  Map of the Moon—Connection of Astronomy and Meteorology ... 140
Notes and Gleanings :
  Comet II, 1863—Winnecke's Comet—Astronomy in the Middle Ages—Observatory at Toulouse ... 140
The Periodic Meteors ... 141
Astronomical Occurrences for the Month ... 142
Table of Double Stars ... 144
Table of Nebulæ ... 145
Variable Stars ... 145
To Correspondents ... 145
List of Subscribers ... 145
Instruments for Sale, &c., ... 146
Advertisements ... 146

LONDON: Private Press—Observatory, Downs Road, Clapton.

The Astronomical Register.

No. 10. OCTOBER. 1863.

Professor C. Piazzi Smyth on the Elchies Telescope in 1862*: from the Transactions of the Royal Society of Edinburgh.*

In the first number of the Astronomical Register we gave a short account of the Elchies Equatoreal. The paper before us contains Professor C. P. Smyth's account of the observations made by him with this instrument, September 1862, with detailed particulars and general deductions. Professor Smyth re-observed twenty-eight double and multiple stars, and has given the magnitude, colour, position in angle and distance, and character of each group, as observed by himself and previously recorded by astronomers, in such a manner as to shew at a glance any change which may have taken place in these particulars. He considers, from his experience with this object-glass compared with the former use of apertures of smaller size, that there is a real advantage in size generally; and that the Elchies instrument in particular not only possesses an enormous amount of light, but defining power in a great degree. "I was looking at γ (Andromeda) and had most admirable proof that the smallness of the discs of the stars was just as it should be, with an excellent quality of object-glass of the given size; for while the "cycle," 5·9-inch, just barely notched the oblong spot of light formed by the two close stars B and C; and while the Pattinson, 7·25-inch, in Teneriffe, shewed them separate, with a black line between them, but yet with their discs mutually compressed on the adjacent sides, and without which compression they must have touched, the Elchies 11-inch, shewed them completely separated and perfectly round,—the distance apart of the two stars being 0″·6, and being believed to have been constant during the three observations."

The Elchies Telescope has no less than three finders—the largest has an aperture of 4·5 inches, power 36; the next 2·2 inches, power 28; and the smallest 1·7 inch, power 17.

The power employed on the large telescope throughout these observations was 397.

MEETING OF THE BRITISH ASSOCIATION.

The Meeting of the British Association, held this year at Newcastle-on-Tyne, under the presidency of Sir W. G. Armstrong, has been very successful—the drier discussions of the sections having been agreeably diversified by a variety of excursions in a neighbourhood possessing great interest for scientific persons of all classes. We can now give but a note of the papers read in the Mathematical Section, of which the following were the most interesting :—"Researches on the Moon," by Professor Phillips; "On the Connection of Sun Spots with Planetary Configurations," by Mr. Stewart; "On the Path of a Meteoric Fire-ball," by Professor Coffin; "On the changing colour of the Star 95 Herculis," by Professor C. P. Smyth; "On Lunar Discoveries," by Dr. Lee; and "Mr. Glaisher's account of his Scientific Balloon Ascents." In the Mechanical Section, a paper on "Boiler Explosions" was read, by the Astronomer Royal.

CORRESPONDENCE.

N.B.—We do not hold ourselves answerable for any opinions expressed by our correspondents.

JUPITER'S SATELLITES.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—To my limited capacity it would appear that the "objections" to the miracle of the Sun standing still, "based on physical science," can only be answered in the mode adopted by your correspondent S. B. H., by shewing that the phenomena which he adduces as familiar to observers of the present day are analogous to the alleged one, whose occurrence is disputed. In any other point of view, reference to an *optical illusion* in an "answer" to those who object to a *miracle* is simply irrelevant.

Whether the authority of the "(whole)" Book of Joshua is, or is not, "dependent on the age of that of Jasher," is a little wide of the mark. If in the "Chronicle of Geoffry of Monmouth," I found an appeal made to "Buckle's History of Civilization" for confirmation of an assertion, I should, to use a mild term, mistrust that portion of the "Chronicle" at any rate.

Did G. B. H. ever seriously reflect upon the results which would accrue from the "standing still" of the Sun? I assume that he is aware that the apparent solar motion is simply referable to the real movement of the earth. That the Sun should stand still therefore would necessitate the stoppage of the axial rotation of our own world. I need trace the effect of this no further than to observe that as every thing at the Equator would be travelling at the rate of some 1038 miles an hour, men, houses, and trees would be projected into space, with about the initial velocity of a cannon ball! The vast mass of the ocean would in low latitudes be flirted off the globe like water off a mop, and in higher ones would overwhelm the land in one stupendous and resistless wave. In fact, instant and terrible destruction must overtake the whole surface of the earth! Of the more purely cosmical results it is needless to speak, albeit the catastrophe would be felt at the dim boundary of the solar system.

A Theologian at least as profound as your correspondent, a man of eminence both for scholarship and piety, Dr. Milman, the Dean of St. Paul's, in his "History of the Jews," unhesitatingly speaks of this quasi miracle as "pure poetry." Let me earnestly commend this interpretation to G. B. H. the next time he feels tempted to provoke a theological discussion in the columns of a purely scientific periodical.

I am, sir, your obedient servant,

4th September, 1863. N.

THE REV. T. W. WEBB'S CATALOGUE.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—As the "Bedford Catalogue" is out of print, I beg to bring under the notice of private astronomers more fully than has yet been done, by the aid of your very valuable journal, a book lately published by the Rev. T. W. Webb, entitled *Celestial Objects for Common Telescopes.* Also an excellent course of papers on Double Stars, &c., lately printed in the monthly periodical known as the *Intellectual Observer.* These, or either of them will give much information —I have found them very useful. I am, Sir, truly yours,

Green Island, Belfast, Aug. 8, 1863. JOHN M. STOTHARD.

NOTES AND GLEANINGS.

The Astronomer Royal has been partly occupying the recess with an investigation into the probability of what was the landing-place of Julius Cæsar at the invasion of Britain.

By the will of the late C. Janson Esq., of Stamford Hill, the sum of £200 is left to the Lee Fund of the Royal Astronomical Society.

Lunar Rainbow.—Instances of this phenomenon have been observed lately—one on the 28th August, at Westerham; and previously Mr. A. S. Herschel saw one at Collingwood on the 25th. Mr. Herschel says, "It presented a perfect arch in the north, when the full moon shone for a few minutes upon a receding storm of heavy rain accompanied by lightning and thunder. The arch was very bright, and colours could be traced in the whole of its length, but most distinctly at the places where the bow rested upon the horizon at its ends."

Waterspout.—Mr. E. J. Lowe thus describes a Waterspout which he observed near Durham on the 4th ult.: "The waterspout was first seen at 11h. 13m. a.m., lasting to 11h. 19m. 15s., when it became hid by clouds. The motion was easterly, passing from Cronkley-moor (and Carr Craggs in the far distance) across the Tees to Langdon Fell. Its diameter varied from 10 min. to a ½ deg., and the length from 35 deg. to 10 deg. It was somewhat white and very opaque, having exceedingly well-defined sharp edges, around which was a fog-like vapour, having a direct motion. Its great singularity was the rapid changes in form which it underwent, at first nearly straight, then curved, and afterwards wavy and snake-like, at one time not unlike a flash of forked lightning. For the first 1½ minutes the waterspout almost touched the ground, after which it became higher. So perfect an example, seen under favourable circumstances, is of rare occurrence."

EXTRACTS FROM LETTERS.

The following extracts from a letter from Mr. G. J. Walker, of Teignmouth, refer to some subjects of interest in our last number:—

"With reference to the approaching *inferior conjunction of Venus* with the Sun, I find in my note-book that I observed the Planet, September 3rd, 1859, at 2½ h. p.m., about 7° from the Sun, power 180; and also July 16th, 1860, when 2 days and 11 hours before her inferior conjunction, and about 6½° from the Sun. Telescope, aperture 3¾ inches, focal length 5 feet."

"I had a very good observation of the *occultation of Kappa Cancri,* April 26th, 1863, referred to in the last number of the Register, and was struck with the remarkable distinctness of the edge of the Moon's dark limb. The star was very bright to the moment of disappearance. Aperture 3¾ inches, power 64."

"The desirableness of a compendious Manual of *Astronomical facts and figures,* as stated by G. F. C. in the last number of the Register, is, besides the reasons given, apparent from the recent determination of the larger amount of the Sun's parallax."

THE PLANETS FOR OCTOBER.

Mercury is favourably situated for observation in the morning at the latter end of October, as it passes its inferior conjunction on the 11th and arrives at its greatest westerly elongation on the 26th. It remains in the Constellation Virgo.

Oct. 1st.	R. A.	13 31 42	Dec. S.	13 29½	Diameter 9″·0.
31st.		13 17 22	„	5 51½	„ 5″·8.

Venus is now a morning star, rising in the east about six o'clock at the beginning, and about half-past three at the end of the month. She is a brilliant object—and as she increases in altitude, becomes more favourably fixed for observation. This Planet remains in the Constellation Virgo, and will now be an excellent object for the transit instrument in the morning for some months to come.

Oct. 1st.	R. A.	12 0 14	Dec. S.	8 49½	Diameter 58″·6.
31st.		11 55 30	„	1 35½	„ 41″·6.

Illuminated portion of the disc of Venus 0·086.

Mars, Jupiter, and Saturn are all too near the Sun to be well situated for observation. All the bright Planets, Mercury, Venus, Mars, Jupiter, and Saturn, are together in the Constellation Virgo at times, during the months of September, October, and November.

Uranus is better placed, and from its great northern declination can be observed to advantage. It continues in the Constellation Taurus.

Oct. 4th.	R. A.	5 38 46	Dec. N.	23 29½.	Diameter 40″·0
28th.		5 37 24	-	23 29.	

Neptune can also be readily observed: with a telescope of moderate size the difference in appearance between this Planet and a fixed star is easily perceived.

Oct. 4th.	R. A.	0 19 0	Dec. N.	0 25½.
28th.		0 16 43	-	0 11.

THE MINOR PLANETS.

The following are the Minor Planets which will be on, or within one hour of Right Ascension on either side of the Meridian, between 9 and 12 o'clock during the evenings of October. Their places are to be found in the Supplement to the Nautical Almanac for 1866.

	Magnitude.		Magnitude.
Flora	8·1	Doris	10·8
Massilia	9·7	Nemausa	10·8
Lutetia	9·7	Alexandria	11·1
Proserpine	11·0	Angelina	10·6
Leda	11·4	Maximiliana	11·4
Eugenia	11·5	Maia	11·8

EXPLANATION OF THE TABLES.

ASTRONOMICAL OCCURRENCES.

The **First** column contains the days of the week, the **Second** those of the month; the **Third**, the hour and minute, in Greenwich Mean Time, of the various occurrences which occupy the **Fourth** column. In this latter, the particulars of any event worthy of observation are given on each respective day: the *magnitude* of the stars is denoted by figures within brackets, thus—(6); in the case of conjunctions, (viz., "Conjunction of Moon and Uranus, 0° 14′ N."), the distance and direction of the *latter* object from the former are indicated—in this case Uranus is 0° 14′ North of the Moon. The **Fifth** and **Sixth** columns contain the visible phenomena of Jupiter's Satellites; here Tr. means *Transit;* Sh., *Transit of Shadow;* I., *Ingress;* E., *Egress;* Ec., *Eclipse;* Oc., *Occultation;* D., *Disappearance;* and R., *Reappearance.* The **Seventh** column contains the *Meridian Passage* of the Moon, or of some star or planet, happening between three o'clock in the afternoon and midnight.

It must be remembered that these Tables are not intended to do away with the necessity of referring to the *Nautical Almanac;* the fact of an event is merely pointed out, with the time of its occurrence, that it may not be missed—observers must seek for closer particulars in the pages of the Ephemeris.

ON THE "TIME" USED IN THE TABLES, &c.

The *Time* used in the Tables of Occurrences and elsewhere is **Greenwich Mean Time**, in which the day commences at Noon, and is continued through the twenty four hours until the following Noon, when another day begins. It has been suggested that the ordinary method of reckoning time would be more easily understood, but this would render necessary the constant use of the signs A. M. and P. M., and also involve the changing of many events from the days in which they are given in the Nautical Almanac into the following days. A little attention will soon overcome any difficulty that may arise, always remembering that from noon to midnight the day of the month and the hour of the day are the same in both methods, but from midnight to noon they differ. Thus, 13 hours on the 1st of the month is 1 o'clock A. M. on the 2nd, 14 hours is 2 o'clock, &c.——In observations which take place an hour or two after midnight, little difficulty or confusion need be apprehended; it is in the morning that mistakes are most likely to occur: the Meridian Passage of Mercury, for instance, is given for the 28th of February at 22 hours 31 minutes, which, in the ordinary way of reckoning time, is a minute beyond half past 10, A. M., on the 1st of March.

It must be carefully borne in mind by those who are commencing their experience of Astronomical matters, that neither of the above methods of reckoning is *Sidereal Time:* this latter is the time shewn by the stars, and gains about four minutes a day on Mean Time, which is deduced from the Sun.

DOUBLE STARS, CLUSTERS, &c.

These Tables were originally arranged from Admiral Smyth's excellent work, the *Bedford Catalogue*, for use in the observing room, in order to prevent the destruction of that indispensable book by constantly turning over its leaves. The positions have been brought to the year 1865, to the nearest five seconds of time and thirty seconds of arc. The Stars are divided into classes, so that the objects best suited to the capacity of the telescope, the eye-piece, or the state of the atmosphere, may be readily selected. In the first column the name of the star is given at the left hand, with the magnitudes of the components, separated by the distance, underneath: this is followed by the angle of position. The second column contains the Right Ascension and Declination, (+ North, − South), and the third column is reserved, for the nsertion of the date of observation, or any other remark.

No Stars closer than 1″·5, or wider apart than 180″, are included in this list, nor any less than the 11th magnitude.

ASTRONOMICAL OCCURRENCES FOR OCTOBER, 1863.

DATE.			Principal Occurrences.	Jupiter's Satellites.		Meridian Passage.
Thur	1	h. m. 20 2	Sidereal Time at Mean Noon, 12 38 53·3 Conjunction of Saturn with the Sun.	The Satellites are invisible during October and November, Jupiter being too near the Sun.		h. m. Alpha Aquarii. — 9 18·4
Frid	2	10 25 15 26 23 15	Conjunction of Mars with the Sun. Conjunction of Saturn and Mars, 1° 35′ S. Conjunction of Moon and Uranus, 2° 24′ N.		h. m. s.	9 14·5
Sat	3	9 42 10 9	Occultation 68 Orionis (6) Reappearance of ditto			9 10·5
Sun	4	7 21	Moon's Last Quarter			9 6·6
Mon	5	12 15 13 14	Occultation of 1 Cancri (6) Reappearance of ditto			9 2·7
Tues	6	12 44 14 16	Occultation reappearance of A¹ Cancri (6) Near approach of Moon to A² Cancri (6)			8 58·7
Wed	7					8 54·8
Thur	8					8 50·9
Frid	9					8 46·9
Sat	10	15 38 22 26	Conjunction of Moon and Venus, 2° 6′ S. Inferior Conjunction of Mercury			8 43·0
Sun	11	18 36	Conjunction of Moon and Saturn, 6° 26′ N.			8 39·1
Mon	12	0 9 3 17 3 41 6 42	Conjunction of Mars and Mercury, 2° 11′ S. Conjunction of Moon and Mercury, 2° 16′ N. Conjunction, Moon and Mars, 4° 23′ N. New Moon			8 35·1
Tues	13	11 49	Conjunction, Moon and Jupiter, 3° 13′ N.			8 31·2
Wed	14					8 27·3
Thur	15					8 23·3

DATE.		Principal Occurrences.		Jupiter's Satellites.		Meridian Passage.
		h. m.			h. m. s.	h. m.
Fri.	16		Sidereal Time at Mean Noon, 13 38 1·5			Alpha Aquarii. — 8 19·4
Sat	17					Moon. — 3 57·5
Sun	18	10 20	Conjunction of Saturn and Mercury, 1° 37′ S.			4 55·5
Mon	19	8 6	Moon's First Quarter			5 52·2
Tues	20					6 47·0
Wed	21	6 20 7 25 14 45	Occultation of c^1 Capricor- Reappearance of do. [ni(6) Conjunction of Saturn and Mercury, 0° 49′ S.			7 39·8
Thur	22	5 44 6 43	Occultation of Kappa Aquarii (5) Reappearance of ditto			8 31·1
Fri.	23	9 50 10 33	Occultation of 16 Piscium Reappearance of do. (6)			9 21·4
Sat.	24					10 11·6
Sun	25					11 2·1
Mon	26	5 55 11 26	Full Moon Greatest Westerly elongation of Mercury, 18° 25′			11 53·6
Tues	27	7 24 8 19	Occultation of 53 Arietis Reappearance of do. (6)			Alpha Aquarii. — 7 36·2
Wed	28					7 32·2
Thur	29	14 1	Near approach of Moon to *l* Tauri (5½)			7 28·3
Fri.	30	7 7 9 44 10 47 15 17 16 32 20 8 21 6	Conjunction of Moon and Uranus, 2° 31′ N. Occultation of χ^1 Orionis Reappearance of do. (4½) Occultation of χ^4 Orionis Reappearance of do. (5) Occultation of 68 Orionis Reappearance of do. (6)			7 24·4
Sat	31	4 48	Conjunction of Jupiter with the Sun.			7 20·4

TABLE OF DOUBLE STARS,

Right Ascension, Twenty-two Hours.

CLASS I.—Division 1.

Stars from the 1st to the 7th Magnitude,
From 20" to 180" apart.

Name of Star, &c. Magnitudes & Distance.	Position Angle.	Right Ascension and Declination.	Remarks.
11 P. XXII Cephei......		22 4 0	
6—21"—6½	317	+58 38	
δ Cephei		22 24 10	
4½—41"—7	192	+57 43½	

CLASS I.—Division 2.

Stars from the 1st to the 7th Magnitude,
From 8" to 20" apart.

53 Aquarii		22 19 10	
6½—9"·9—6½	301	−17 25½	

CLASS I.—Division 3.

Stars from the 1st to the 7th Magnitude,
From 3" to 8" apart.

ζ Aquarii..................		22 21 50	
4—3"—4½	347	− 0 42½	

CLASS II.—Division 1.

Stars from the 7th to the 11th Magnitude,
From 20" to 180" apart.

π¹ Pegasi..................		22 3 15	
5—74"—10	259	+32 31	
10 Lacertæ		22 33 10	
6½—59"—10	48	+38 20½	
τ¹ Aquarii		22 40 30	
6—30"—9½	113	−14 46	
16 Lacertæ		22 50 15	
6—64"—9½	47	+40 53	

CLASS II.—Division 2.

Stars from the 7th to the 11th Magnitude,
From 8" to 20" apart.

65 P. xxii Lacertæ ...		22 13 0	
6½—15"—9	192	+37 5½	

CLASS II.—Division 3.

Stars from the 7th to the 11th Magnitude,
From 3″ to 8″ apart.

41 Aquarii .... 6—4″·8—8½ 119	22 6 50 −21 44½	
33 P. xxii Pegasi ...... 7½—6″·5—10½ 315	22 7 45 +16 31½	

CLASS III.—Division I.

Close Stars, from the 1st to the 11th Magnitude, 1″·5 *to* 3″ *apart.*

200 P. xxii Aquarii ... 7—2″·7—8½ 314	22 35 55 − 9 1½	

Triple and Multiple Stars.

33 Pegasi .... 10—2″·5—6½—57″—8	22 17 10 +20 10	
8^2 Lacertæ .... 11—28″—6½—22″·5—6½—82″—10	22 29 50 +38 56	
219 P. xxii Aquarii ... 8—4″·2—7½—55—9	22 40 50 − 4 55½	

TABLE OF NEBULÆ.

Right Ascension, Twenty-two Hours.

NAME OF NEBULA	Right Ascension.	Declination.
75 Hersc. viii Lacertæ ... A large and loose cluster.	22 10 0	+49 12½
55 Hersc. I. Pegasi......... Excessively faint—practically invisible.	22 58 15	+11 36

NOTICES TO CORRESPONDENTS.

As a publication of this nature is peculiarly liable to errors, we trust our friends will kindly point out any they may detect; and we may add that we shall at all times be most happy to adopt, as far as practicable, any suggestions which may tend to render our pages more intelligible or useful.

NOTICE.—We have published the present number of the Register earlier in the month than usual, in order that the Editor may "take a holiday." We therefore postpone the greater portion of our correspondence, with various other papers, until November.

MARKREE OBSERVATORY.—In consequence of the death of the proprietor, all the ASTRONOMICAL INSTRUMENTS, Transit Circle, Clocks, &c. and Library in connexion therewith, are now for SALE, in one lot. Value £2,500.—*Times.*

INSTRUMENTS, &c., FOR SALE.

Applications respecting prices and other particulars to be made to the Editor of this paper—if by letter, enclosing stamp for postage of answer.—These notices, which are restricted to *three lines* each, are inserted free of charge to Subscribers.

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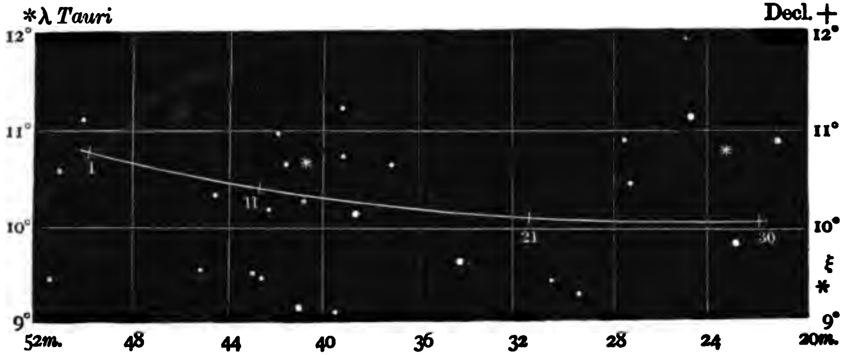
LONDON:—J. D. POTTER, Admiralty Chart Agent,
31, POULTRY, and 11, KING STREET, TOWER HILL.

CONTENTS.

Page
Professor C. P. Smyth on the "Elchies" Telescope ... 149
Meeting of the British Association ... 150
Correspondence:
Jupiter's Satellites——Rev. T. W. Webb's Catalogue ... 150
Notes and Gleanings:
The Astronomer Royal——The Lee Fund——Lunar Rainbow——Waterspout ... 151
Extracts from Letters:
Inferior Conjunction of Venus——Occultation of Kappa Cancri——Astronomical Facts and Figures ... 151
Positions of the Planets ... 152
Explanation of the Tables ... 153
Astronomical Occurrences for the Month ... 154
Table of Double Stars ... 156
Table of Nebulæ ... 157
To Correspondents ... 157
Instruments for Sale, &c., ... 158
Advertisements ... 158

LONDON: Private Press—Observatory, Downs Road, Clapton.

Path of Vesta: November, 1863.



R. A. 3 HOURS. *Magnitudes*—ξ and λ *Tauri*=4.

Magnitude Scale for Stars on the Chart:— * 5 ● 7 · 8

The Astronomical Register.

No. 11. NOVEMBER. 1863.

THE EARTH'S DISTANCE FROM THE SUN.

A very valuable letter on this subject has been communicated by Mr. Hind to the *Times*, and as the matter is of the utmost importance to all interested in Astronomical Science, we give an outline of the communication for the benefit of our readers.

Mr. Hind gives a pretty full account of the transits of Venus in the years 1761 and 1769, from the observations of which the generally accepted parallax of the Sun was obtained. The results of the observations made in 1761 were so discordant, as very much to disappoint the expectations formed; but the researches of Encke gave 8″·49 as the most probable parallax deducible from this transit. The transits of Venus generally happen in pairs, an interval of eight years elapsing between the two, while from the last of the one pair to the first of the next, either 105 or 122 years will intervene. The second transit of the pair is the most favourable for obtaining the Sun's parallax, and in 1769 therefore great preparations were made. The phenomenon was observed by Captain Cook, at the island of Tahiti, in the Pacific, and at other southern stations; while it was seen in Norway by a Viennese Astronomer. Some doubts have been thrown on the latter observations, but the discussions of Encke give 8″·57 as the resulting parallax from this transit, or a distance of 95,365,000 miles.

The first serious doubts as to the accuracy of this distance seem to date from the publication of Professor Hansen's lunar tables in 1854, Mr. Airy having previously reduced the immense mass of meridional lunar observations taken at the Greenwich Observatory between the years 1750 and 1830, the results of which were printed in 1847. The erection of the Altazimuth instrument, for closer and more continued observation of the Moon followed—and the amount of what is called the "parallactic equation," an irregularity directly connected with the solar parallax, was more particularly ascertained. If the amount of this inequality, as given by observation, does not agree with that computed with an assumed value for the Sun's distance, we know that the latter requires correction, and it is easy to ascertain to what amount. The solar parallax finally given by Hansen was 8″·97.

Again, the lunar equation in the theory of the earth, newly investigated by Mr. Leverrier, has led that eminent mathematician to infer a diminution in the accepted distance of the Sun. This is also implied by the excess in the motion of the node of the orbit of Venus, and the similar excess in the motion of the perihelion of Mars, also detected by the same mathematician, while a very singular confirmation of these results is given by the experiments of M. Foucault, on the velocity of light, who finds that it does not require that time to travel which has hitherto been considered to be the case, and that as the time taken by light in coming from the Sun to us is known with great precision, it follows that the Sun must be so much nearer as is due to such diminution of velocity. Mr. Foucault gives 8″·86 as the solar parallax deduced from these experiments.

Lastly, the observations for solar parallax, made by means of the planet Mars, at its opposition last year, in which numerous comparisons of the place of the Planet, with stars in its vicinity, were procured at Greenwich, Pulkova, the Cape of Good Hope, and William's Town, Victoria, give a parallax, varying from 8″·93 to 8″·97, as the result.

Mr. Hind concludes by giving a few of the numerical changes required by the substitution of the parallax of 8″·95 as determined by M. Leverrier for that of 8″·57 of Professor Encke, which has hitherto been accepted.

	Miles.	Diminution.
The Earth's distance from the Sun....	91,328,600	4,036,000
Circumference of her orbit	599,194,000	25,360,000
Diameter of the Sun	850,100	38,000
Velocity of light per second	183,470	8,000

The distances, velocities, and dimensions of all the members of the Planetary system of course require similar corrections, if we wish to express them in miles; in the case of Neptune, the mean distance is diminished by about 122,000,000 miles. These numbers shew the great importance of a precise knowledge of the Sun's parallax, in our appreciation of the various distances and dimensions in the solar system.

On the Determination of the Magnitudes of Telescopic Stars. By the Rev. W. R. Dawes.

In the valuable pamphlet "On the method of observing Variable Stars," which was so liberally circulated along with the October number of the Astronomical Register, the authors, Mr. Knott and Mr. Baxendell, have done me the honour of referring to my photometrical method of determining the magnitudes of telescopic stars, by the apertures of an achromatic object-glass, with which they are just visible, as explained at length in the Monthly Notices of the R. A. S., vol. xi, pages 187 to 198.

In the pamphlet referred to, it is stated on page 5,—"There is so fair an accordance between the magnitude-estimates of several of the best meridian observers, that their results may be conveniently taken as the basis of a more extended scale, as has been done by the Rev. W. R. Dawes, &c." But this is quite a mistaken view of my proceedings and intentions, and is, in fact, precisely the thing which I was most anxious to avoid! My main object was to steer clear of all previous estimations of telescopic magnitudes; and starting from the *average sixth magnitude* as the *smallest just steadily visible with the naked eye*, to calculate the telescopic apertures deduced from the aperture necessary to shew a sixth magnitude, and an *arbitrary light-ratio;* and by those apertures to *determine* the magnitudes of the stars, *without any regard whatever to any estimations of them by previous observers.*

From this it will be perceived, that the remark on page 6, line 8 from the bottom,—" and was that adopted by the Rev. W. R. Dawes," is exactly the reverse of the fact, for I decidedly preferred the *first* of the two methods there specified:—that is, I determined experimentally the telescopic aperture with which the sixth naked-eye magnitude could be just steadily perceived (as the sixth magnitude is *just steadily perceived,* not *just invisible,* with the naked eye); and then assuming an *arbitrary ratio* (the same as Struve had aimed at in his telescopic estimations), I calculated a *theoretical scale of apertures* by which to *determine* the magnitudes of all stars observed, without reference to any catalogues whatever.

Mr. Baxendell has made a similar mistake in his note on page 12, line 10, &c., where he says,—"The 'ratio of light' derived by Mr. Dawes from observations of 187 stars, between the 6th and 9th magnitudes, taken from Bessel's and Argelander's zones, was 4·00." But the fact is, that none of these stars were observed till *after* I had calculated and prepared my series of apertures, based on Struve's assumed ratio, and the aperture 0·15 in. for a sixth magnitude star; and they were then observed *for no other purpose* than to ascertain the differences between previous *estimations* by Lalande, Bessel, and Argelander, and my own actual determinations by apertures, according to my calculated and independent scale. With reference to this part of my proceedings, I have said (page 194, line 5, &c., of my paper): "But it is especially a matter of interest to ascertain how far the magnitudes, photometrically determined by the plan now proposed, agree with those which have been employed by the observers of the most extensive star-catalogues. *To this end* I have examined a considerable number of objects, &c." And on page 195, line 19, I have remarked,—" On the whole, the agreement of the magnitudes determined by the proposed method with those employed by the three great zone observers, is far more close than I could have ventured to anticipate, &c."

It does not appear (so far as I am aware) that any of these observers had any particular light-ratio in their minds, in making their estimations of magnitude. It seems to have been commonly the habit of star-observers to aim at assimilating their estimations to those of previous observers; and, if so, there is no ground for surprise at a fair approach to uniformity in such estimations:—in fact, it could scarcely have been otherwise.

But Professor Struve, when at Dorpat, adopted a very different and quite independent scheme for the estimation of the magnitudes of the double stars forming his large catalogue, assuming as his ratio of light that a star, having only *one-fourth* of the light of another, should be rated *one magnitude lower* in the scale. Thus, starting from the sixth magnitude as the lowest usually visible with the naked eye, a star, having one-half of its brightness, was classed as of magnitude 6½; and a star, having one-fourth of its brightness, was classed as of the 7th magnitude; and so on down to the 12th magnitude, which Struve assumed would be the smallest steadily visible with his 9·6-inch refractor at Dorpat. It is certainly a very remarkable coincidence, that with the achromatic aperture which renders a sixth-magnitude star just steadily visible to my own eye (viz. 0·15-inch), and with Struve's ratio which I have adopted, the calculated aperture for determining objects, just steadily visible to be of the 12th magnitude, is precisely 9·6-inch!

In Mr. Pogson's paper, on star-magnitudes in the *Monthly Notices*, vol. xvii, on page 15, he has erroneously supposed that Struve assumed the 12th magnitude as the smallest visible with the 15-inch Poulkowa refractor: and, consequently, the third column in his table at the bottom of that page, which he has given as representing the Struvian magnitudes (and my own also) answering to the apertures in the second column, is altogether wrong; as it assigns magnitude 11·9 to the aperture 14·4 inches instead of magnitude 12·0 for aperture 9·6 inches.

One great advantage (as it appears to me) of the Struvian scale is, that it is *borrowed from no other*, and is quite independent of all previous estimations. And another and perhaps greater advantage is, that it is *perfectly uniform from the sixth magnitude downwards:* and I therefore cannot but regret that it has been so generally cast aside in favour of some imitation of, or approximation to, Argelander's scale of estimations, which is far from being uniform in the very important matter of the light-ratio. From the 6th magnitude to about the 9th, the light-ratio deduced from Argelander's estimations of all his stars which I compared with my own scale, though very nearly the same, is actually somewhat *higher* than Struve's and my own, which is 4·0. Indeed it is remarkable that, as is shewn in my table at the top of page 195 in my paper, the average of Argelander's estimations of 26 stars determined by my method to be of magnitude 8·5, comes out equal to 8·37; by the difference of which numbers Argelander has given to those stars a *higher* place in his scale than they would occupy in mine. And almost precisely the same difference was found to exist between his estimations of 23 stars which in my scale were of the 9th magnitude, but by his estimations were of magnitude 8·86. So that down to the 9th magnitude the light-ratio deduced from his estimations is even *higher than Struve's*. But *below* the 9th magnitude his light-ratio is stated by Mr. Pogson (in his paper on magnitudes in M. N., vol. xvii, page 14) to be about 2·5. There is therefore at about that point a decided change in the ratio of the estimations, causing the upper and lower portions of the scale to be quite inconsistent with each other.

P.S.—I beg to be permitted to correct some errata in my photometrical paper above referred to.

Page 192, line 3 from the bottom, *for* deducible from, *read* converted into.
,, 195, line 4, *for* +0·14, *read* —0·14.
,, 198, line 23, *for* 11·34, *read* 11·40.
,, ,, line 25, *for* 16·68, *read* 16·80.

See also the list of errata on page 248 of vol. xi. of the *Monthly Notices*.

THE INFERIOR CONJUNCTION OF VENUS,
September, 1863.

Downs Road, Clapton.

Having to leave town at the time of this interesting occurrence, we were not able to observe the Planet later than the 17th of September. On that day she was well seen, at 2h., and at 3h. 15m., p.m. The crescent was sharply defined, and in spite of the strong glare of the Sun, the Planet was readily seen in the telescope by persons unaccustomed to such observations. Telescope 3⅜ in. aperture, focal length 4 ft.

We have since received the following communication on the subject, which shew that there has been no difficulty in viewing the Planet at this comparatively unfavourable conjunction.

Observations by Mr. G. J. Walker, of Teignmouth.

1863.

Sept. 11.—Observed Venus this morning at 11h. 30m. a.m. Powers—60, 175, and 90. Best seen with 90. Sky not very favourable. The south horn seemed the sharper of the two, and the inner part of the thin crescent less well defined.

Sept. 22.—Took the meridian passage in transit instrument (30 inch.) A handsome object. Discerned also in small star-finder, by Horne & Thornthwaite, as a little white curved line.

Sept. 28.—Passing clouds. Caught her just approaching the last wire in the transit instrument. Viewed afterwards with 2¼ in. equatoreally mounted telescope, with powers 60, 90, and 175. Best seen with the two former. When a cloud passed over the Sun, the cusps seemed finer and more prolonged. Fancied the preceding cusp rather less sharp than the following; but the sky was never free from haze, even when to the naked eye it seemed clear. Several members of my family also saw the Planet, when their eyes got accustomed to the glare. Upon the whole, I could see no perceptible difference in the cusps. The crescent seemed of sufficient thickness to admit of easy measurement, had I been provided with a micrometer. Observed the Planet from 12½h. to 13¼h., so I saw her about seven hours before conjunction. Unable to follow her later, owing to clouds and intervening trees.

Sept. 29.—Seen through clouds twice in the transit instrument. Viewed later with equatoreal telescope, and powers 60 and 90, crescent perhaps slightly thicker than yesterday; at best moments, when the haze was lessened, she formed about half a circle by estimation. The Planet was directly in the line of the cloud drift.

Oct. 6.—Observed her meridian passage in transit instrument. Saw her later with power 175 in equatoreal. Not half a circle to-day. (Looked for Mercury in vain, though I thought I saw the *ghost* of him once.—Perhaps the glare was too great.)

Extract from a letter from Mr. Joseph Green, of West Bromwich.

Sept. 24.—"I had a very good view of Venus a little before noon this day; I estimated the breadth of the crescent at about 1¼″. The cusps were lengthened, making quite a semicircle, and I thought at times they were extended beyond this. The best views I had were when clouds were passing over the Sun; at such times the crescent was beautifully defined, and once I thought the following cusp was blunted, or rather, at a few seconds from its point was broader than the other one. I could not verify this, the first view being very transient, and shortly afterwards dense clouds covered both Sun and Planet."

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—Although the atmosphere here on the 28th ult. was somewhat hazy, and the altitude of Venus only 25°, I saw her very well at 1h. 15m. with a 5ft. refractor, aperture 3⅞in., and power 60—the Planet being within eight hours of the conjunction, and about 8° below the Sun.

The crescent was well defined up to its cusps, and of greater apparent breadth than I expected from the illuminated portion of the disc not probably exceeding 0·012 (Diameter = 1.) And near to its centre a spot much brighter than the adjacent surface was discernible. My impression also was that there were indications of the unenlightened disc, both within the crescent and beyond the cusps, especially the southern; this impression may be illusory, and perhaps arose from our acquaintance with the phenomena exhibited by the Moon in similar phases, but whether so or not, I have frequently observed the same appearance, and never more so than on the 6th instant, at 11h. 30m. a.m., when the sky was remarkably clear, and whole of the disc for a moment seemed to be distinctly visible.

The next Inferior Conjunction, on the 7th May, 1865, will be a very interesting one. The Planet having then 21° of N. Dec., and being about 4° above the Sun, not more, probably, than 0·005 of her disc will be illuminated, whilst her great altitude will be very favourable to detect the presence of the phenomena alluded to.

I am, sir, your obedient servant,
W. L. BANKS.

Ealing, Oct. 10th, 1863.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—May I beg, *apropos* of the late Inferior Conjunction of Venus, to record, with an observation made then, a few more of that and other Planets in difficult positions, as I have been much interested with the visibility of Planets in the day-time, and believe myself to have been unusually successful.

On Sept. 28th last, I saw Venus with perfect ease, power 50; no precautions save a dew cap; atmosphere in very bad state. At the Inferior Conjunction of July, 1860, I also saw her quite easily 5½° from the Sun, powers 90 to 180; definition much better, the thin crescent appeared like half the rim of a tumbler glass.

In September, 1859, I traced her through *Superior* Conjunction, observing her on two or three days in succession, as her oblique motion kept her all that time at nearly the same distance (about 1°) from the edge of the Sun's disc. Very difficult to observe at all, the aperture of the telescope had to be reduced to 2¾ inches, and a coloured glass used to shade the eye, powers 90 to 130. At each observation, I had to gaze some minutes before her small round disc became visible, and then only by glimpses.

In June 1859, I detected the pale disc of Jupiter, when only 11° from the Sun; the day hot, and very clear; Planet at a great altitude. I have also repeatedly observed some of the satellites in the day-time, and the belts distinctly, but never succeeded in observing a shadow-transit during sunshine. Once, Jupiter being in quadrature and very high, I saw the first, second, and third satellites an hour, and the fourth 20 minutes, before sunset. Whenever I could see a satellite in the telescope, I could also detect the Planet with the naked eye. Powers 130 to 220 were necessary, as the discs must subtend an appreciable angle. Mercury I can only see occasionally at mid-day, though sometimes very distinct when gibbous and in perihelion, the atmospheric circumstances being also favourable. Once seen distinctly with a good finder, 1⅝ inch aperture, power 16. It always appeared to me, even when in perihelion, to be less bright, surface for surface, than Venus.

My telescope is 4⅛ inches aperture, and 5½ feet focal length.

I beg to remain, sir,
Your obedient servant,
W. H. WHEELER.

Oxford, Oct. 15th, 1863.

EARTHQUAKE IN ENGLAND.

A rather severe shock of an Earthquake was felt all over England on the morning of Tuesday, the 6th ult. Mr. Hind thus describes it in a letter to the *Times*:

"About 22 minutes after three this morning the tremor of an earthquake was very perceptible here. It appeared to me that the oscillatory motion was from E.N.E. to W.S.W., lasting three seconds, or rather less. I heard no sound whatever after the shock, but cannot say positively whether any preceded it. The sky was partially clear at the time, and the air perfectly still. The sensation produced by the tremor was very peculiar, and different from that of ordinary vibration."—Mr. Bishop's Observatory Twickenham, October 6th.

Mr. Charles Dickens says:—

"It was exactly as if some great beast had been crouching asleep under the bedstead, and was now shaking itself, and trying to rise."

Mr. E. J. Lowe, of Beeston, says:—

"The motion of the earthquake-pendulum of this Observatory was from W.N.W. to E.S.E., and the displacement of chalk by the 30-ft. rod was half an inch, the index-needle moving the chalk so as to leave an oval, or rather a lengthened oval hole."

The Rev. H. Cooper Key, of Stretton Rectory, Hereford, describes its effects as that of—

"A very heavy and long train rushing through a station. * * * The bed on which I lay was violently shaken, and the iron bars of the shutters of the room rattled loudly against the shutters. * * * The sound at first increased rapidly with a gradual *crescendo* for two or three seconds, until the crash was felt (which lasted for about 1½ seconds, and consisted of two concussions), and then subsided as gradually for some seconds more, until it died away in the distance. It appeared to me to equal the loudest peal of thunder I ever heard, but it was fuller and deeper and grander than thunder. In about three minutes afterwards a second faint rumble was heard."

Earthquakes in England are not so rare as might be supposed,—there are records of no less than 116 in England and 139 in Scotland. The *Times* graphically describes this country as lying on the great volcanic belt—as being only a link in the chain that binds "Hecla to Vesuvius, Ætna, and the original Volcano in the Lipari islands. There runs under us a huge crack—who knows how deep or how

wide ? * * * Who can say what shaking or upheaving, sinking, dividing, or drying-up may await us ? We know by science these isles have gone through many a strange metamorphosis, and science cannot assure us that there are none more to come."

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—The Earthquake felt in England on the 6th inst. is only one of many that this island has experienced, especially in those parts where the sub-stratum consists of igneous rocks. I subjoin a list of some of the most remarkable, and where they were most felt, without entering into diversified opinions as to the cause of Earthquakes, which is better left for geological research to determine.

Should you think this list worthy a place in your valuable Journal, an insertion will oblige

Your obedient servant,
W. FROST.

3, Chatham Place, Hackney,
Oct. 15th, 1863.

Year.	Where felt.	Consequences.
1110	Shropshire	
1116	Wales	
1120	Somersetshire	
1134	Kent	Flames issued from the earth in several places.
1185	East of England	Destroyed the Church of Lincoln.
1249	Somersetshire	
1250	St. Albans	
1274	Somersetshire	Threw down the Church of Glastonbury
1328	All England	The most severe ever felt in England.
1382	South Counties	Many Churches thrown down.
1426	Midland Counties	Accompanied by thunder & lightning.
1428	All England	Very severe.
1571	Herefordshire	Marcley Hill was removed; it contained twenty-six acres.
1665	Oxford	
1683	Many parts of England	
1693	England, France, Germany	60,000 persons perished in Sicily. Spanish Town, in Jamaica, was destroyed.
1703	England and Rome	Aquila, in Naples, destroyed, and 7000 persons.
1734	Ireland	Destroyed 100 houses and 5 churches.
1755	London	Lisbon destroyed.
1790	Perthshire	Many violent concussions, and great variations in the barometer.
1850	North Wales	
1863	Many parts of England	

The Astronomer Royal states that Mr. Ellis, who was observing the collimation of the wires of the Altazimuth, at Greenwich, at the time of the Earthquake, perceived the mark to move in so extraordinary a manner that he thought the wall to which it was attached was in motion. Lord Wrottesley's assistant, Mr. Hough, also, while observing at Wolverhampton at the time in question, felt a rocking motion in his chair.

The Earthquake Pendulum at Beeston, is described by Mr. E. J. Lowe as consisting of a wooden rod, 30-ft. long, freely hung in a tube six inches in diameter. To the lower extremity of the rod, a brass ball (about the size of an orange) with a steel point or index is attached. The index touches a quantity of chalk—and the Earthquake, by moving the position of the town to which the tube is attached, causes the index to plough up the chalk, the length of removed chalk registering the displacement of the summit of the town, while the line points out the direction of the shock.

CORRESPONDENCE.

N. B.—We do not hold ourselves answerable for any opinions expressed by our correspondents.

THE OCCULTATION OF KAPPA CANCRI.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—In reference to the occultation of Kappa Cancri by the Moon on April 26th, I have found the following memorandum in my Observatory book, which confirms Mr. Copeland's observation :

"April 26th—Kappa Cancri occulted by the Moon at 12h. 3m. 32·5s. L.S.T. ; the disappearance was *not* instantaneous by fully half a second."

About an hour previously I had watched the disappearance of Jupiter's second Satellite, when I noticed that the Satellite appeared projected *upon* the disc of the Planet for at least thirty seconds before its disappearance. At the time, I attributed both phenomena to some very peculiar condition of our atmosphere. The day had been cloudless: barometer, reduced, 9 a.m., 30·358 ; wind N. W. My telescope has an aperture of 6·8 inches, and a focal length of 12 feet, and during the above observation a power of 150 was used with the micrometer.

I am, sir,
Your obedient servant,
C. LEESON PRINCE.

Uckfield, Oct. 16, 1863.

THE LUNAR CRATERS.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—Allow me to solicit the attention of your readers generally and of G. J. W. in particular to a very curious discrepancy between Beer & Mädler's large Map of the Moon, and their celebrated work "Der Mond." There are two craters between 20° and 30° south latitude, and 75° and 85° west longitude, both shewn on the Map, and both seen on the lunar surface. In the Map, the smaller crater of 5° extent in longitude and 4° in latitude, about the size of the well-known spot, Plato, is marked Humboldt, the letter W being prefixed. The situation of the W is scarcely within the western rim of the large crater. Apparently, on the Map, the large crater is nameless. The Rev. C. Lowndes, Rector of Hartwell, who viewed with me this magnificent crater, on the evening of the 29th ult., being desirous of knowing to what the letter A in the large crater on the Map referred, I wrote to the Rev. T. W. Webb, who most obligingly communicated to me the following particulars :—

"My dear Sir,—It gives me great pleasure to assist your very interesting "undertaking in any way. On referring to the text of Beer & Mädler, I "find what the Map certainly would not have led us to expect—that your

"great wall plain *is* their W Humboldt, the passage bearing the following
"free translation:—
"'W Humboldt, extending from – 23° to – 30° latitude, and + 78° to
"' + 85° longitude, is, after Schikard and Clavius, the largest wall moun-
"'tain of the lunar surface, and more regularly formed than either of them.
"'If it lay more in the centre of the Moon it would probably have been
"'reckoned among the Maria. In its far west position, it appears bright,
"'but with two obvious dark spots * * both sharply defined, and only
"'visible in high illumination. The ring mountain is sufficiently high to
"'shew its summits in the night side with complete distinctness, even in
"'this oblique position.
"'Humboldt has by it on the east a second ring mountain, of conside-
"'rable dimensions, and several other larger and smaller ring mountains
"'close upon both of them."'

Mr. Webb further adds—"The position of the name in the Map resulted, "I dare say, from want of room, but it is misleading."

As it is exceedingly important in describing lunar appearances to have each distinct locality clearly specified and *named*, and as in this part of the Moon there is a most interesting similarity between the crater W Humboldt, Legendre, a nameless crater south of Legendre, Hase and Palitzsch on the west, and Petavius, Snellius, Stevinus, Reichenbach, Borda, and Santbech on the east, W Humboldt and Petavius each having a smaller but un-named crater east of it, and, as I intend at no distant period, should I be permitted, to draw up a short paper on these interesting selenographical relations, pointing as they do to the manifestation of forces acting more or less in a circular direction, especially towards the south-east, around a comparatively quiescent centre, of which the Mare Nectaris may be cited as an example. I would suggest that the un-named crater near W Humboldt be designated "Phillips," commemorative of the labours of our great geological astronomer, and that near Petavius, "Wrottesley," also commemorative of the interest which Lord Wrottesley has always taken in astronomy.

I am, sir, your obedient servant,
W. R. BIRT.

Hartwell Observatory, Sept. 2nd, 1863.

P. S.—The Rev. T. Webb requests me to say that he "regrets to find, on examining his own reduction of Beer & Mädler's Map, that he has been quite misled by the greater conspicuousness of the eastern crater, in future to be designated "Phillips," and introduced it under the name of W Humboldt, which in reality occupies the space between it and the limb."

W. R. B.

OCCULTATION DURING THE LUNAR ECLIPSE.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—I have just seen a copy of the Astronomical Register for Aug. 1863, containing an enquiry from a correspondent concerning a small Star occulted by the Moon during the last total eclipse. I saw no answer in the September number, and therefore beg to say that I observed the eclipse with a good refractor, of 4½ inches aperture, and noticed the occultation of a Star about the seventh magnitude, accompanied almost simultaneously by two others, of about the 10th magnitude, soon after the commencement of the total phase. The next morning I examined the B. A. Catalogue, and identified the Star as 15 Ophiuchi. I also noticed a remarkable increase in the brilliance of the two small Stars *very* soon after their emergence. Whether this was caused by a stratum of thin cloud at that spot, or by a lunar atmosphere, may, I presume, be proved from other observations by astronomers differently situated with regard to such a cloud. We cannot often see Stars of the 10th magnitude occulted. The two in question were just visible *after* their increase in brilliance, with a second-rate refractor, of 2⅞ inches aperture.

I am sir, yours, &c.,
W .H. WHEELER.

Oxford, Sept. 11th.

[Our Correspondent has not observed Mr. Walker's communication: Astro. Register, p. 138.—*Ed.*

GREAT MEETING OF THE HEAVENLY BODIES.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—This day we have an extraordinary Meeting of many of the leading members of the Solar System—in fact, all the old aristocracy of the skies. The Sun, the Moon, and the five Planets known to our grandfathers are all together. Would some of your correspondents, who are deep in the science, let us, who are merely lookers on, know when this happened before, and when we may expect its like again? This information would oblige many, especially

Your obedient servant,
Oct. 12th, 1863. J. P. S.

SUGGESTIONS AND ENQUIRIES.

Is there anything in the "Connaissance des temps," and the "Effemeride Astronomiche di Milano," useful and interesting to amateurs, besides our own invaluable Nautical Almanac?

Would it be possible to give in the Register Sir J. Herschel's method of determining the approximate elements of the orbits of double stars by a graphical construction? It is alluded to at p. 292 of the "Cycle of Celestial Objects," by Admiral Smyth, vol. I.

As few amateurs probably have by them the Nautical Almanac for several years in advance, might it not be useful occasionally to give some places of those of the Minor Planets as large as the 10th magnitude?

As Notices of Works on Astronomy appear in the Register, perhaps sometimes notices of several that have been out more or less time would be a help to amateurs, not in the way of knowing so much as others.

THE EARTHQUAKE.—Mr. E. J. Lowe, who has been requested to draw up a report on this occurrence for the British Meteorological Society, asks for the following information:—

1. Whether at any place the water in the sea, rivers, or canals was seen to alter its level?
2. Where clocks were noticed to stop?
3. What was the effect in coal and other mines?
4. Whether any marked difference was noticed in the violence of the shocks, in places near each other, and under what conditions?
5. At what places was the Earthquake felt on the east coast, or in any northern county, especially north of Liverpool. Whether felt in Ireland, the Isle of Man, or the Channel Islands, and where on the Sea?
6. Where any noise was heard, its loudness and peculiarity?

Origin of the Milky Way.—Admiral Smyth in his "Cycle" enumerates various ancient and modern conceits regarding the Milky Way. The following, however, will probably be new to many. Some time since a relative of mine was passing an evening with Professor Donati, at the Observatory at Florence; among other objects, the telescope was directed to the milky way, when one of the company said "Qui dabbero il Creatore ruppe lo staccio." (Truly here the Creator broke the sieve.) On enquiring what this meant, Donati replied that there was a vulgar dettato (saying) which imagined the divine intention of marshalling all the stars of different magnitudes in particular groups and constellations; but while this was being done, the "staccio"—*anglice*, sieve—broke in the middle, and spilling the star-dust in space gave rise to the milky way!

G. J. W.

NOTES AND GLEANINGS.

New Minor Planet.—On Sept. 14th, Mr. Watson, Director of the Observatory of Ann Arbor, Michigan, U.S.A., discerned a new minor planet, the 79th of the series.

Mr. **Hind** has recently brought out "An Introduction to Astronomy," being a revised reprint of his "Illustrated London Astronomy," and his "Astronomical Vocabulary" combined.

Curious Nebula.—The *Philosophical Magazine* for August contains a letter communicated to the Royal Society by Mr. Lassell, on the well-known planetary nebula in R.A. 20h. 56m., Dec. 11° 56′ S. He says—"With comparatively low powers it appears at first sight as a vividly light blue elliptic nebula, with a slight prolongation of the nebula, or a very faint star at or near the ends of the transverse axis." Under high powers and the most favourable circumstances, "I have discerned within the nebula a brilliant elliptic ring, extremely well defined, and apparently having no connexion with the surrounding nebula, which indeed has the appearance of a gaseous or gauze-like envelope, scarcely interfering with the sharpness of the ring, and only diminishing somewhat its brightness." A drawing and further details are given.

Solar Photometry.—Mr. Alvan Clark has communicated to the American Academy of Arts and Sciences the results of some experiments carried on by him for determining the rates of the Sun's light to that of a bright star. He made use of a horizontal underground gallery 230 feet long, through which the Sun's rays on a very clear bright day were made to pass, by the agency of a prism and mirror to obtain the required reflection. He employed a lens of one-thirty-fourth of an inch focal length, and thus reduced its diameter 93,840 times, when it presented a brilliancy "which was estimated at scarcely equal to *α* Lyræ." Allowing ten per cent. for loss of light in the reflections, and counting some companions of *α* Lyræ without the lens; the author decides as the final result that if the Sun were removed to a distance, 103,224 times its present distance, it would shine with precisely the same brilliancy as the star referred to.

New Astronomical Society for Germany.—We have just received a copy of the rules of a new Astronomical Association founded at Heidelberg on Aug. 28th last. The preamble states that it "is a Federal Union of Astronomers and the friends of Astronomy for promoting the advancement of the science, especially by conducting such kind of work as requires the systematic co-operation of many observers." The following are the provisional committee,—Argelander, of Bonn, Struve of Pulkova, Bruhns, of Leipzic, Schönfeld, of Mannheim. Förster, of Berlin, Zollner, of Leipzic, and Zech, of Tübingen: the last named acting as secretary.

THE PLANETS FOR NOVEMBER.

Mercury passes from Virgo to Scorpio during November, and may be seen as a morning star at the beginning of the month, when it rises about five o'clock.

Nov. 1st.	R. A. 13 22 29	Dec. S.	6 24	Diameter 5″·6.
30th.	16 20 13	„	22 12	„ 4″·4.

Venus is well situated for observation as a morning star, rising due east soon after three o'clock during the month. It arrives at its greatest brilliance on the 5th.

Nov. 1st.	R. A. 11 57 21	Dec. S.	1 35	Diameter 40″·4.
30th.	13 21 52	„	6 26½	„ 27″·0.

Illuminated portion of the disc of Venus 0·354.

Mars and **Jupiter** are unfavourably situated, owing to their proximity to the Sun, although the latter Planet may be seen in the early morning.

Saturn may be seen in the morning, rising shortly after four o'clock at the beginning and about a quarter before three at the end of the month.

Nov. 1st.	R. A. 12 48 33	Dec. S.	2 48
30th.	12 59 47	„	3 53½

Dimensions of Ring—Outer Major Axis, 36″·5. Outer Minor Axis, 6″·5

Uranus is in the Constellation Taurus, and is well fixed for observation, rising about half-past six in the evening at the beginning and about half-past four at the end of the month.

Nov. 1st.	R. A. 5 36 59	Dec. N.	23 29	Diameter 4″·0
29th.	5 32 51	-	23 26½	„ 4″·2

Neptune continues well situated for observation, being very nearly on the Equator, and passing the Meridian about half-past nine at the beginning and eight o'clock at the end of the month.

Nov. 1st.	R. A. 0 16 23	Dec. N.	0 8½
29th.	0 14 45	S.	0 0½

THE MINOR PLANETS.

The following are the Minor Planets which will be on, or within one hour of Right Ascension on either side of the Meridian, between 9 and 12 o'clock during the evenings of November. Their places are to be found in the Supplement to the Nautical Almanac for 1866.

	Magnitude.		Magnitude.
Vesta	7·1	Doris	10·8
Hebe	7·9	Pales	9·6
Hygeia	10·4	Nemausa	11·0
Melpomene	8·2	Alexandra	11·1
Proserpine	11·2	Pandora	10·5
Leucothea	13·1	Angelina	10·7
Lætitia	9·0	Maia	11·9
Eugenia	11·3		

ASTRONOMICAL OCCURRENCES FOR NOVEMBER, 1863.

DATE.		Principal Occurrences.		Jupiter's Satellites.		Meridian Passage.
		h. m.			h. m. s.	h. m. Fomalhaut —
Sun	1		Sidereal Time at Mean Noon, 14 41 6·4	The Satellites are invisible during October and November, Jupiter being too near the Sun.		8 7·7
Mon	2					8 3·8
Tues	3	3 34	Moon's Last Quarter			7 59·8
Wed	4	16 12 17 16	Occultation, 14 Sextantis Reappearance of do. (6)			7 55·9
Thur	5	7 0 16 15 17 22 18 27 19 45	Greatest brilliancy of Venus Occultation, B.A.C. 3726(6) Reappearance of ditto Occultation of 55 Leonis(6) Reappearance of ditto			7 52·0
Frid	6					7 48·0
Sat	7	13 59	Conjunction of Moon and Venus, 3° 58′ N.			7 44·1
Sun	8	9 23	Conjunction of Moon and Saturn, 6° 17′ N.			7 40·2
Mon	9	4 53 21 39 22 49	Conjunction of Mars and Mercury, 1° 12′ N. Conjunction, Moon and Mars, 2° 34′ N. Conjunction of Moon and Mercury, 3° 38′ N.			7 36·2
Tues	10	 6 41 19 59	Eclipse of the Sun, invisible at Greenwich. Conjunction, Moon and Jupiter, 2° 39′ N. New Moon			7 32·3
Wed	11					7 28·4
Thur	12					7 24·4
Frid	13	8 58	Conjunction of Jupiter and Mercury, 0° 11′ N.			7 20·5
Sat	14					7 16·6
Sun	15					7 12·6

DATE.		Principal Occurrences.		Jupiter's Satellites.		Meridian Passage.
		h. m.			h. m. s.	h. m.
Mon	16		Sidereal Time at Mean Noon, 15 40 14·7			Moon. — 4 43·3
Tues	17	15 5	Moon's First Quarter			5 36·8
Wed	18	6 41	Near approach of Moon to 51 Aquarii (6)			6 28·0
Thur	19	12 12 13 9 12 16 13 11	Occultation of κ Piscium, Reappearance of do. (4½) Occultation, 9 Piscium (6) Reappearance of ditto (Two occultations close together.)			7 17·7
Fri.	20					8 6·6
Sat.	21	7 12	Conjunction, Jupiter and Mars, 0° 40′ S.			8 55·7
Sun	22	23 23	Conjunction, Saturn and Venus, 0° 55′ S.			9 45·4
Mon	23	17 33 21 36	Occultation disappearance of 53 Arietis (6) Conjunction, Venus and Theta Virginis, 2m·4 E.			10 36·1
Tues	24	14 53 18 4 21 1	Conjunction of Venus and Theta Virginis, 0° 11′ N. Eclipse of the Moon Full Moon			11 27·6
Wed	25					12 19·2
Thur	26	13 40	Conjunction of Moon and Uranus, 2° 27′ N.			Fomalhaut. — 6 29·4
Fri.	27					6 25·5
Sat	28					6 21·5
Sun	29					6 17·6
Mon	30	10 33 11 37 18 50 19 9	Occultation, 60 Cancri (6) Reappearance of do. Occultation of Kappa Cancri (5) Reappearance of ditto			6 13·7

TABLE OF NEBULÆ.

Right Ascension, α, or Twenty-four Hours.

NAME OF NEBULA	Right Ascension.	Declination.
18 Hersc. v. Andromedæ...	0 33 5	+40 57
Large and pale, in a field of telescopic stars.		
31 M. Andromedæ.........	0 35 30	+40 32
A splendid nebula, of fusiform aspect, with a bright nucleus.		
1 Hersc. v. Ceti	0 41 10	−26 2
Very faint and pale; so close to the horizon as to be scarcely distinguishable.		

Neither the first nor third of our objects demands any special remark, but this is by no means the case with the second: 31 Messier Andromedæ is the brightest, as it is the oldest known of all the nebulæ in the heavens, and has, as Sir John Herschel tells us, been perpetually mistaken for a comet. This resemblance to one of these erratic bodies will at once strike the observer. The whole nebula is fusiform, and more than fills the field of the telescope, even with a low power: the nucleus is of remarkable brilliancy. To the south is a companion like a nebulous star.

Large Meteor.—In a note to the *Times*, Mr Lowe describes an unusually large meteor observed by him at Beeston on the evening of the 15th October, at 9h. 59m. 49s. G.M.T., which remained in view exactly five seconds. Its form was circular, its colour at first yellow, changing to intense blue; and the light emitted so strong as to render the distant landscape distinctly visible. Two other meteors of large size were observed by Mr Lowe about the same time.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—I had the good fortune to witness the most magnificent meteor I ever saw on Thursday night last, at 10h. p. m. It came into sight from the South East, and passed rapidly along the heavens towards the West, in a line, as far as I could judge, a little below the Equinoctial. The nucleus, which was fringed, was of a light blue colour, as was the tail; the diameter of the former was rather more than a third of that of the Moon. The tail passed through a cloud, and left a yellow and green light in the cloud for several minutes.

Earl's Barton, Northampton, I am, Sir,
Oct. 20. 1863. Yours, &c., D.T.K.

A letter signed J.L.L., in the *Standard*, describes a brilliant meteor, colour at first golden, afterwards deep blue, passing through Pisces directly under the Moon, which the writer observed on the evening of the 23d October, at 9h. 25m. This meteor was in sight for about ten seconds, and seemed to be as large as Venus.

The New Comet discovered by Messrs Bücker and Tempel (independently) will be near 55 Ursæ Majoris on the 2nd November, and near 2 Canum Venaticorum on the 12th; and will enter the constellation Boötes on the 18th. Its brightness is increasing.

Nov. 1.	R.A.	11h.	5m.	22s.	Decl. +	35°	46′
20	,,	13	6	42	,,	45	26

Mr Phillips of Charlton House near Cheltenham states in a note to the *Times*, that he saw a "Large Comet" at 10 o'clock in the evening on the 15th October, about 25 or 30 degrees above the horizon, in the South or South West.

The Planet Vesta.—As Vesta will be at opposition on the 16th of the month, and of the 7·1 magnitude, she will be a conspicuous telescopic object; we therefore present our readers with a chart of her path, kindly forwarded to us by Mr Knott of Cuckfield. The magnitudes and positions of the stars are taken from Argelander's catalogue, and the places of Vesta from the Supplement to the Nautical Almanac.

Eclipse of the Moon.—A partial Eclipse of the Moon takes place on the morning of the 25th of November, about 6 o'clock: it will however be only partly seen in London, as the moon sets about a quarter of an hour after the first contact with the shadow.

First Contact with Penumbra............Nov. 25, 6h. 4m., A. M.
First Contact with Shadow............... " 7 16 "
The Moon sets eclipsed at 7 32.

An Eclipse of the Sun takes place on the 10th November, but is invisible in Europe.

THE ASTRONOMICAL REGISTER.

List of Subscribers.

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NOTICES TO CORRESPONDENTS.

S.B.K.—See the address in No. 6 of the Register.

J.F.B.—The Register has never been published later than the 2nd of the month, and so late as that only in two instances: the extraordinary delay mentioned has arisen with those through whom it has been procured.

Communications from G.F.C.; J.H.; and A. Bird; in our next.

P.V., "On an Equatorial Stand," and "Report of the Astronomer Royal for Scotland," received.

As a publication of this nature is peculiarly liable to errors, we trust our friends will kindly point out any they may detect; and we may add that we shall at all times be most happy to adopt, as far as practicable, any suggestions which may tend to render our pages more intelligible or useful.

ERRATUM.—In the Pamphlet on "Variable Stars," page 10, line 13, for represent, read *represents.*

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CONTENTS.

Page
The Earth's Distance from the Sun 161
On Star Magnitudes, by the Rev. W. R. Dawes 162
Inferior Conjunction of Venus 165
Earthquake in England 167
Correspondence:
Occultation of Kappa Cancri—The Lunar Craters—Occultation during the Lunar Eclipse—Great Meeting of the Heavenly Bodies 169
Suggestions and Enquiries 171
The Earthquake—Mr Lowe's Report 171
Origin of the Milky Way 172
Notes and Gleanings:
New Minor Planet—Astronomy by Mr Hind—Curious Nebula—Solar Photometry—New German Astronomical Society ... 172
Positions of the Planets 173
Astronomical Occurrences for the Month 174
Table of Nebulæ 176
Large Meteors 176
New Comets 176
The Planet Vesta 176
Eclipse of the Moon 177
List of Subscribers 177
To Correspondents 177
Instruments for Sale, &c., ... 178
Advertisements 178

LONDON: Private Press—Observatory, Downs Road, Clapton.

The Astronomical Register.

No. 12. DECEMBER. 1863.

TO OUR READERS.

With the present number, the concluding one for the year 1863, we beg to tender our sincere thanks to all those who have so kindly encouraged us in our endeavour to establish an Astronomical Periodical, not only by their assurances of the general usefulness of "The Register," but also by the pecuniary support they have afforded us by the prompt payment of their subscriptions.

It would, indeed, be highly gratifying to us to be able to announce that "The Register" has reached the desired position of "paying its own expenses," and has so far proved a success; but we are with much regret compelled to state that such is by no means the case.

When it is considered that the number of our readers is necessarily limited, we have no reason to be dissatisfied with our subscription list; there are, however, many extra and comparatively heavy expenses connected with the production of a scientific periodical which are wholly unavoidable.

From the flattering opinions conveyed to us in numerous letters, we may be permitted to state our conviction that "The Register," in a great measure, does supply what was much needed, especially among amateurs; it would therefore be truly mortifying to be obliged to discontinue it; at the same time, anxious as we are still to persevere with the publication, we do NOT feel justified in doing so at a positive personal loss. Under such circumstances, the only course open to us is to raise the price of the paper, earnestly hoping that notwithstanding the slight addition to the subscription "The Astronomical Register," will still retain its present supporters, and that through their influence, their number will steadily increase.

On and after the 1st of January, 1864, the price of "The Astronomical Register" will be one shilling per number; and the subscription (including postage), three shillings per quarter.

ROYAL ASTRONOMICAL SOCIETY.

◆

The first Meeting of the season was held on the 13th November, Dr. Lee, *Vice-President*, in the Chair.

Secretary, Rev. C. Pritchard.

Eighty presents were announced: among them a set of six stereoscopic views of the Moon, photographed by Messrs. Smith & Beck, from the original negatives of Mr. Warren De la Rue.

Wm. Martin, Esq.,
The Rev. J. C. Bates, and
A. C. Ranyard, Esq.

were balloted for, and duly elected Fellows of the Society.

M. Kowalski,
M. Wiennecke,
M. Leon Foucault, and
Mr. G. P. Bond

were balloted for, and duly elected as Associates.

Dr. Lee read an interesting report on a subject tending to the *promotion of Astronomy between England and France.* The Minor Planets, now nearly eighty in number, are more than one Observatory can attend to; an arrangement has therefore been made between the astronomers of Greenwich and Paris to join in managing these "troublesome little fellows." M. Leverrier has offered to observe them from full to new moon, and Mr. Airy from new moon to full; and Dr. Lee congratulated astronomers upon the inauguration of a plan so well calculated to promote intercourse between English and French observers.

Mr. Glaisher, explaining the great difficulty of observing seventy-nine Planets, stated that this was the first time two Observatories had agreed to work together. The Moon was the especial charge of the astronomers at Greenwich; it would be hard therefore on the observers there, if they had always to look after these Planets also. Mr. Glaisher added, that independently of his connection with the Royal Observatory, he could state that no place in the world had ever taken so many observations of these small Planets as Greenwich, and laid claim to the greatest credit for Mr. Airy for the efficient manner in which it had been accomplished, but the increasing number of these small bodies must eventually interpose a limit to what could be done by one Observatory. He was, therefore, glad that the utmost cordiality existed between the astronomers of Paris and Greenwich on this important subject.

Mr. Pritchard asked if it was not owing to the great transit circle having been provided by the Astronomer Royal, that these Planets had been so well observed?

Mr. Glaisher acquiesced, and added, that unless a similar instrument had been erected at Paris the arrangement could not have been entered into.

Mr. Pritchard (who mentioned that owing to the illness of Mr. Hodgson the reading of all the papers devolved on himself) then read a Paper by M. Hansen, on the *Calculation of the Sun's Parallax from the Lunar Theory.* This paper contained in substance what was given by Mr. Hind in his letter to the *Times*, a condensed summary of which we gave in our last number, shewing that by various investigations on the Solar Parallax, more especially by M. Hansen's Improved Lunar Tables, the distance of the Sun from the Earth required to be reduced by about four millions of miles. Mr. Pritchard observed that many persons had taken occasion to ridicule the labours of astronomers from this circumstance. "Four millions of miles!—what donkeys the astronomers are to make such a mistake: we took astronomy to be absolutely accurate. Down goes astronomy, up goes theology: the astronomers confess to a mistake of four millions of miles!" But let us look at this distance of four millions of miles a little more closely. The Sun's Parallax is eight seconds and a half; four tenths of a second are to be added. How can this be represented? Take a hair and measure it, and you will find that the correction amounts to this—that we have to look at a hair at a distance of 125 feet! That is the correction astronomers have made. Or let us look at a sovereign at a distance of eight miles—it amounts to about the same thing. Instead, therefore, of saying "down with astronomy and up with theology," Mr. Pritchard added, we ought to be thankful that we are able to calculate and correct such nearly inappreciable quantities.

Mr. Stone said that after going over the calculations again, he found them to agree most closely—the Solar Parallax deduced being 8″·94.

A letter was read from the promoters of a *New Astronomical Society* founded at Heidelberg, with the rules, terms of admission, &c.—the

meetings not always to be held at the same place. Mr. Pritchard said it was pleasing to see the scientific men of the continent taking a lesson out of our book: we wish them as much success as we have met with ourselves—we need not wish them more.

On the origin of the *apparent luminous band* which has been seen to surround a portion of the Moon's limb in partial eclipses of the Sun, by the Astronomer Royal. The question was—if there is an atmosphere to the Moon, would it cause the Moon's dark limb in an eclipse of the Sun to be surrounded by a light band? These calculations shew that such could not be the case.

In noticing a forthcoming new edition of Sir J. Herschel's "Outlines of Astronomy," Mr. Pritchard called attention to a correspondence between the author, himself and Mr. De la Rue on the subject of Mr. Nasmyth's Solar "Willow Leaves." Continental astronomers deny their existence; but Mr. De la Rue saw them at Mr. Pritchard's Observatory at Clapham, with a six-inch object-glass by Cooke, and has since seen them with a four-inch, by Dallmeyer. He (Mr. Pritchard) felt convinced that anyone could see them, even with a three-inch object-glass, if he had properly adapted eye-pieces, and knew exactly what to look for.

A Paper, by the Rev. Henry Cooper Key, on some "*Remarkable Depressions seen on the Moon's Western Limb*," on the evening of September 20th, 1863, was read by Mr. Birt. At first Mr. Key thought that there must be some defect in the instrument with which he viewed them, an unsilvered 12-inch glass speculum; but having verified them the same evening with a smaller speculum (8-inch) he became convinced that they were really depressions below the general surface of the Moon. The Rev. T. W. Webb also verified their existence, and was able during the lunation, October to November, to keep them in view several days. The application of the Micrometer wire shewed their departure from the general curvature of the limb very distinctly. Early in the lunation, November to December, Mr. Key ascertained that the central depression (there were three) coincided with the large Mare, near the western limb, which has lately received the name of Mare Smythii; and the southern one appeared to bisect the large depressed surface, Wilhelm Humboldt, which is sufficiently extensive to be ranked among the Maria. It is probable the remaining depression is coincident with the Mare Humboldtianum.

Mr. Drach thought the appearance of depression on the Moon's limb might possibly be caused by mirage, aurora, or other atmospheric disturbance.

Mr. Birt observed that the Mare Smythii caused a depression, but he had not perceived anything like that observed by Mr. Key.

Mr. Birt then read a Paper on the "*Extension of Lunar Nomenclature.*" In the course of his enquiries the author had met with numerous instances of craters, some of large extent, and other portions of the Moon's surface, of a decidedly individual character, destitute of names, and it had been suggested to him by Dr. Lee, that the naming of such tracts would contribute to the advancement of Selenography. In accordance with this suggestion Dr. Lee and Mr. Birt named some of the more prominent of these tracts, specifying in the first instance their selenographical co-ordinates, on the authority of Beer & Mädler. It is not unlikely that Mr. Birt will re-determine their co-ordinates from actual measurement. In the mean time it may be desirable to direct the attention of astronomers to them. The paper was accompanied by a list of nearly twenty lunar spots that had received names during the last two years.

A note from Capt. Higgins, of Bedford, on the *Changing Colours of* 95 *Herculis,* stated that it was not possible to note the amount of change of colour each night, but that it could be detected after several nights observation. "This Star," adds Admiral Smyth, by whom the letter was communicated, "is now a crucial instance of sidereal colour changing, and it is to be hoped that this field, so elegant, so useful, and so easy, may be followed up, especially by young astronomers."

Mr. Pritchard stated that a letter from the Astronomer Royal threw some doubt on this subject—the simultaneous change of colour in both Stars being suspicious, and looking like a change in the telescope.

Mr. Lockyer said that Professor Smyth had noticed that the Stars did not change in the same manner, but towards different colours, and Mr. Pritchard observed that the subject was well worthy of investigation.

A drawing of a stand for a reflecting telescope, by the Rev. H. C. Key, was exhibited to the meeting.

In a Paper on the *Periodical Changes of η Argus,* Mr. Abbott, of Hobart Town, asked that attention might be paid, in observing variable Stars, to the *variability of the Stars of Comparison,* as many suspected changes noticed in Stars may be attributable to changes in the Stars observed with them.

The meeting then adjourned.

CORRESPONDENCE.

N.B.—We do not hold ourselves answerable for any opinions expressed by our correspondents.

"JOSHUA COMMANDING THE SUN TO STAND STILL."

Sir,—When an individual is narrating some surprising event, and at the same time he unconsciously mentions some secondary circumstance, which secondary circumstance is well known to the listener, but which the narrator has no idea that the listener is acquainted with, the truth of the secondary circumstance goes far to establish the main fact, which was before strongly doubted. For instance, suppose an Indian Officer at Calcutta were listening to two natives in conversation, and one of them was telling the other as a main fact that he had been in London, and that as he rode on an omnibus from a place called Knightsbridge to the Bank of England, the omnibus was upset opposite a long brick building on the right hand, on the top of which building was a statue of a lion with extended tail. The other native might strongly doubt the main fact—that the narrator had been in London, but the officer who was silently listening would, if he knew London, be convinced that the narrator had been there, because he mentions as a secondary circumstance the lion on Northumberland House, which would be to the right hand in going from Knightsbridge to the Bank.

Now let us apply this rule to the narrative as recorded in the tenth chapter of the book of Joshua. The words uttered by him were "Sun, stand thou still upon Gibeon;" and the writer adds, "the Sun stood still, and the Moon stayed."

Now the main fact here recorded is the stoppage of the Sun's motion, the secondary fact is the stoppage of the Moon's motion; the time of the day when the supposed miracle took place was about five, p.m.; the time of the year probably March or September. The sun was rapidly sinking in the west, and the crescent moon, probably about five days old, was low in the south-west, and from the point where Joshua stood might appear between two mountains, being viewed along the valley of Ajalon. Joshua now pronounces the words, the sole object of which was, that the day might be lengthened, in order that sufficient light might be afforded to complete the discomfiture of the retreating enemy.

I pause here to notice, that it has been conceded on all sides that Joshua had no suspicion that what took place was a stoppage of the diurnal rotation, or that he was acquainted with that fact at all. To him the Sun and Moon would appear to revolve round the Earth once every day, the Sun going considerably faster than the Moon; and if anyone had suggested to him that their "setting in the west" was due to one and the same cause, Joshua would have pointed to the nightly *later* setting of the Moon as a convincing proof of the more rapid daily motion of the Sun, and consequently of his totally independent motion from that of the Moon. Now, if Joshua was unacquainted with the diurnal motion, he would be equally ignorant that the Moon's rising and setting was caused by that motion; when, therefore, he says—"Sun stand thou still" as his main fact, and the writer adds as a secondary circumstance, "and the Moon stayed," he mentions the very result which would occur from a stoppage of the diurnal motion.

If he had said—"Sun stand thou still, and thou Moon go on," I for one would not have believed a word of the story; but when the result which followed Joshua's words was true to nature, though not to appearance, we have a right to ask the objectors how it was that the writer of the book of Joshua should, with such precision, mention as a secondary fact the very appearance which would take place with regard to the Moon's motion, notwithstanding he was totally ignorant of the diurnal motion.

As to the monthly motion of the Moon from west to east, supposing that to be continued, the difference in the Moon's retrograde position would be too trifling to be mentioned, or perhaps observed, in a space of ten or twelve hours, as the main fact—the standing still of the Sun for the purpose of extending the day-light till the rout of the enemy was completed—was all that the writer laid stress upon.

With regard to the centrifugal motion at the equator, we are not told that the stoppage was instanter; but, without going into that part of the question, we may safely conclude that, if by the power of God the diurnal motion was arrested, He that made the world could well provide for all contingencies.

All natural laws are divine intentions, and the Being who in a particular way intends, surely has the power to vary His intention by special act. The writer of the book of Joshua evidently expected that grave objection might be made to the story, for he concludes with a remarkable sentence, shewing the exceptional nature of the event, which he directly refers to the power of God, which sentence is well worth the consideration of Dean Milman, Bishop Colenso, and all believers in the Bible who cavil at its miracles:—the words are as follow—"*And 'there was no day like that before it or after it, that the Lord hearkened to the voice of man.*"

I am, sir, yours respectfully,
ALFRED BIRD.

Birmingham, Oct. 19th, 1863.

BIBLICAL ASTRONOMY.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—I have little taste for controversy on this subject, but the letter of your correspondent N. is so daringly audacious, that at the risk of being voted a dealer in prohibited wares, I must ask the favour of a corner for a brief reply.

N. seeks to shelter himself under the ægis of a dignitary of the church: a staunch churchman myself, I cannot consent at all to Dean Milman's opinion *(if it really is his)* being allowed to over-ride one of the most fundamental doctrines of the christian religion—implicit belief in the authenticity of the holy scripture. This is sufficiently assailed in the present day, so that, so far, N's puny artillery is of little moment; but the proposition I start with, *ab initio*, is this—that although it is perfectly true that the miracle of the standing still of the Sun cannot be explained on any physical principle, yet the circumstance of its being declared in holy scripture silences (or ought to silence) all cavil. Therefore, for N. to join with anyone in thinking this miracle but pure poetry, is neither more nor less than profanity, which any christian worthy of the name ought to resent.

It is quite true that the stoppage of the Earth's usual rotation is involved in an *ordinary* occurrence of this kind, but we are not dealing with an ordinary occurrence, and therefore N. and all who think with him, ought to be strongly censured for presuming to say that that is impossible which God thinks fit to do, out of the usual course of things. If the doctrine is to be accepted that we are only to believe so much of the bible as we can understand on the "laws of nature," then so much of the bible would have to be rejected, as to leave little behind worth having. If this it N's notion, all I can say is that I am sorry for his mental darkness.

Further argument on this point would be thrown away, so I beg to remain
Your obedient servant,
Oct. 1st, 1863. G. F. C.

[We have received other letters on this subject, but may perhaps be permitted to suggest that it has now been sufficiently discussed.—*Ed.*]

THE "PARALLACTIC LADDER."

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—To those who do not possess a regular equatoreal stand, I strongly recommend the parallactic ladder as the next best substitute. Admiral Smyth, in the first volume of the Bedford Catalogue, gives very plain directions for the construction of one (see page 377.) It can be made by any intelligent workman, at a small cost. In the original plan an iron casting is required for the south pivot of the frame; but if a casting cannot conveniently be procured, a stout stick of heavy wood firmly placed in the ground will answer very well. If the ladder is *carefully* fixed in a meridian line, and *parallel to the axis of the earth*, it gives at once the equatoreal motion so much desired, and a Star or Planet is kept in the field of the telescope continually with one simple motion given by the hand in following the object.

For day observation it is very valuable, and any Planet or Star large enough for the power of the glass is easily found when in the meridian, and may be followed for hours. I find Venus and Jupiter constantly in the day-time with it, without the slightest trouble, and the declination of any Stars may be marked off roughly on the frame, so as to bring the cradle carrying the glass sufficiently near the mark to find it by day when in the meridian, provided the telescope is powerful enough.

Of course it must be *carefully placed*, and when that is done, it is a good rough equatoreal, by means of which many objects may be found with a little fishing for in the day-time.

I built one strong enough for a four-inch telescope at a cost of £3.

I remain yours obediently,
Bedford, 19th Sept., 1863. J. H.

PLANETARY CONJUNCTIONS.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—The following passage transcribed from my little *Hand-Book of Astronomy*, will, with the 'Supplement,' afford to J. P. S., all the information

I am able to place my hand on. Additional instances will be acceptable for a future edition; and if individuals will rake up their memories, may be more will be forthcoming.

"It is stated that a conjunction of Mars, Jupiter, Saturn, and Mercury, in the constellation *Shi*, was assumed as an epoch by the Emperor Chuenhio; and it has been found by MM. Desvignoles and Kirch that such a conjunction actually did take place on February 28, 2446 B.C., between 11° and 18° Piscium. Another calculator, De Mailla, fixes upon Feb. 9, 2641 B.C., as the date of the conjunction in question; and that the above four planets, with the Moon, were comprised in an arc of 12°, from 15° to 27° Piscium. He gives the following positions:

	R. A.		
	°	′	″
Mercury	344	56	16
Mars	356	45	11
The Moon	353	18	21
Jupiter	347	2	12
Saturn	354	39	47

The following are some other instances of this kind:—

In the years 1507, 1511, 1554, 1564, 1568, 1620, 1624, 1664, 1669, 1709, and 1765, the three most brilliant planets—Venus, Mars, and Jupiter—were very near each other.

On Nov. 11, 1524, Venus, Jupiter, Mars, and Saturn, were very close to each other, and Mercury was only 16° distant.

On Nov. 11, 1544, Venus, Jupiter, Mercury, and Saturn, were enclosed in a space of 10°.

On March 17, 1725, Venus, Jupiter, Mars, and Mercury, appeared together in the same field of the telescope.

On Dec. 23, 1769, Venus, Jupiter, and Mars, were very close to each other.

On Jan. 29, 1857, Jupiter, the Moon, and Venus, were in a straight line with one another.

On July 21, 1859, Venus and Jupiter were very close to each other: the actual conjunction took place at 3h. 44m. A.M., at which time the distance between the two planets was only 13′. They accordingly appeared, to the naked eye, to be but one object. At the end of 159 years, Mars, Jupiter, and Saturn, return to nearly the same part of the heavens: this will next happen about the year 2000."

Supplement.—On Dec. 19, 1845, Venus and Jupiter appeared in the same field of view.

Sometime in 1801, Venus, Jupiter, and the Moon, were in conjunction in Leo.

On Sept. 15, 1186, Mercury, Venus, Mars, Jupiter, and Saturn, were in conjunction between the wheat ear of Virgo, and Libra.

I am, Sir,
Your obedient Servant,
Nov. 2nd, 1863. GEORGE F. CHAMBERS.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—Your correspondent J. P. S., called attention in your last number to the fact of the Sun, Moon, and five older Planets, having been near each other at the new Moon of October. They were of course almost as near at the new Moons in September, and this month, November; but all are now slowly separating. When they are to meet again, we might calculate, if it were worth the trouble; but I write this to say, that we have a trustworthy record of the same phenomenon having occurred in 1186 (reign of Henry II.), at the same time of the year, and of course, in the same constellation, viz., Virgo.

I am, sir, your obedient servant,
Nov. 20th, 1863. CLERICUS.

OCCULTATION OF χ' ORIONIS, OCTOBER, 30, 1863.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—Your Scotch readers well understand what "Every mickle makes a muckle," means. On this principle, here follows a note from my journal. "Emersion, certainly not instantaneous; after first appearance, the Star was several seconds in recovering its full light."

Mag. 4½ : Dark limb : 3in. aperture : 3ft. 9in. focus : power 120.

Your obedient Servant,
Oct. 31st, 1863. G. F. C.

DOUBLE STAR IN ORION.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—May I call the attention of those of your readers who possess telescopes of sufficient power to a neat double star which I came across while sweeping with my 7⅓in. refractor? I have failed to find it in those catalogues which I possess, though it is hardly probable that it has not been observed before. The Star in question is ψ^2 Orionis; its mean place for 1865·0 being, R.A., 5h. 19m. 46s., Decl. + 2° 58′·6. It may be well to remark, that the double star Struve 712 (Hersc. I. 53), precedes by about 18 seconds, 10′ S. Two sets of wire micrometer measures in February last, yielded the following results:—Position, 322°·43. Distance 2″·95, the distance being rather doubtful, on account of the faintness of the small star. I was much struck with the fine blue colour of the comes, which I estimated to be of about the 11½ magnitude.

I am, sir, yours, &c.,
Woodcroft, Cuckfield, G. KNOTT.
Nov. 16th, 1863.

VISIBILITY OF THE DARK SIDE OF VENUS.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—Turning my telescope (6in. aperture by *Cooke*), upon Venus on the 22nd October last, I was much surprised to see almost the whole of the unilluminated disc of the Planet; it was so striking in appearance, that I thought it must be the resemblance to the new Moon, which made me *fancy* that I could see the unilluminated portion. My sister-in-law, whom I called to witness the Planet, but without telling her what to look for, said she instantly saw the whole disc. The atmosphere was beautifully clear, but still the Planet was so far past conjunction, that I should scarcely have imagined the phenomenon would be visible.

I am, sir, yours, &c.,

Stanton-by-Dale, J. F. BARBER.
Nottingham, Nov. 18th, 1863.

[The Editor perceived the same appearance of the Planet on the 25th October; the observation being confirmed by a lady, in a precisely similar manner.]

THE NEW ASTRONOMICAL SOCIETY.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—It chanced that at the end of August, I was passing a few days at Heidelberg, and had taken up my quarters at the Hotel Prinz Karl. On the evening of Saturday, Aug. 29th, we were aware of preparations for a considerable supper, and as the evening wore away, sounds of much speechifying, interrupted and followed by clapping, stamping, shouts of laughter, and much clinking together of glasses, proceeded from the supper-room. The party finally broke up at a late hour. Next morning, I remarked to the waiter: "You had an uncommonly lively party here last night; was it the meeting of some festive club of the town?" "No, Sir," said he, "they were Astronomers." In the last number of the "Astronomical Register," I see it is stated that a new Astronomical Association was founded at Heidelberg, on Aug. 28, last. It may interest, or at any-rate amuse, the devotees of the science in England, to know that the new Association was inaugurated, under the most decidedly 'jolly' auspices. Long may it last, and great may its success be.

I am, yours obediently,
C. P. M.

THE REV. T. W. WEBB'S CATALOGUE.

TO THE EDITOR OF THE ASTRONOMICAL REGISTER.

Sir,—May I beg permission, through the medium of your valuable publication, to correct two errors which, I regret to say, are to be met with in my little work entitled "Celestial Objects for Common Telescopes?"

The first, which was obligingly pointed out to me by Mr. Knott, occurs at p. 166, where the "open 6-mag. pair," referred to under "56," is really the same with the following object, 57 Aquilæ, which has thus inadvertently been entered twice.

The other is in p. 172, where the "small round cluster of minute stars," mentioned under 38 M., is really 39 Hersc. VII, the next object but one following; and conversely, the "superb low-power field," referred to under 39 Hersc. VII, is the cluster 38 M.

I remain, Sir, yours obediently,

Hardwick Parsonage, Nov. 23, 1863. T. W. WEBB.

SUGGESTIONS AND ENQUIRIES.

Aerolite. — In looking over Chambers' Chapter on Meteoric Astronomy, I find no mention of a remarkable Aerolite which fell Feb. 11, 1830. I remember hearing the explosion perfectly well. It is stated in "Things not Generally Known," p. 30, on the authority of E. J. Lowe, Esq., F.R.A.S., that it exploded in Bedfordshire, at the height of 23½ miles. I should like to know where the explosion took place. D.T.K.

The "*Connaisance des Temps,*" contains no amateur matter. It differs from the N. A., chiefly in being inferior to this world-renowned publication. Sometimes its supplements, however, contain valuable technical memoirs. Much the same remarks apply to the Ephemerides of *Milan*, and *Berlin*, and the *American Nautical Almanack*. G. F. C.

Mars.—Observers interested in this Planet, will find a memoir by the Rev. T. W. Webb, in the October *Intellectual Observer*, which will repay perusal. C.

Large Instruments.—I hope you will be able to furnish your readers with some information on the subject of the large Equatoreal recently erected at Greenwich; also with regard to the 20½in. object glass, recently preparing by Porro of Paris, and mentioned in Mr. Webb's book. D. T. K.

The Moon.—Mr. Birt's important communication in the last Number of the Register, about the lunar wall plain, W. Humboldt, reminds me of an error I found some time ago in Beer and Mädler's small map, where 57 Fracastorius, and 58 Sautbeck, are interchanged. They should stand (in the marginal list) 57, Sautbeck, 58, Fracastorius. Not having B. and M.'s large map, I cannot say if the same mistake exists there. G. J. W.

Aurora Borealis. — Mr. Lowe of Beeston, and Mr. Wood of Weston-Super-Mare, give an account in the *Times* of a splendid display of Aurora, which took place on the night of November the 14th between seven and eight o'clock. The former gentleman notices, that during the November epoch (the 12th and 13th) the usual shooting stars have been singularly deficient this year.

LITERARY NOTICES.

Loomis's Practical Astronomy *.—While works of all degrees of merit on Descriptive and Physical Astronomy abound in nearly every modern language, it is somewhat remarkable, that *Practical* Astronomy has hitherto met with but relatively few exponents. "Pearson's Practical Astronomy," the text book of some thirty or forty years ago, is now to a considerable extent obsolete; the apparatus and modes of employing it, therein described, having been in a great measure superseded by the modern improvements due to Simms, Ransomes, Ross, &c., as constructors, and to Airy, Sheepshanks, Challis, and others, as employers of our more recent instruments. It is true that Sheepshanks contributed some most admirable articles to the "Penny Cyclopedia," on the Transit, Equatoreal, &c., &c., and these may be found in the "English Cyclopedia," which is just published, though in a form scarcely convenient for observatory reference. It is therefore, with great pleasure, that we earnestly recommend to every possessor of an observatory, the really admirable work of Professor Loomis, with the title of which we have headed this notice. It is divided into 12 chapters. The first treats of the structure and furniture of an observatory, and incidentally of the testing of the optical part of the Telescope. The second is devoted to the Transit Instrument. The third to various graduated Circles. The fourth to the Diurnal motion. The fifth to time. The sixth, seventh, and eighth, to Latitude, the Ecliptic, and Parallax. The ninth contains miscellaneous Problems. The tenth and eleventh are devoted to Eclipses and Occultations, while the twelfth treats of the Longitude. Collections of Formulæ, and thirty-seven elaborate sets of Tables (including a Catalogue of 1500 Stars, with constants for reduction), complete the work, of which it is not too much to say, that it is incomparably the best, upon the subject, in the English language. To any one who has mastered the rudiments of plane and spherical trigonometry, or even to any possessor of an observatory, who may be content to follow rules without understanding them, we must express our sincere conviction, that "Loomis's Practical Astronomy," is absolutely indispensable.

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* New York—Harper Brothers, London: S. Low and Son.

In the *English Churchman* of the 12th ult., there is a "Parochial Lecture on Astronomy," by G. F. Chambers, Esq., which will be found of great use to any one desirous of placing the principal facts of the science before a school or parish audience, in a popular manner. It is illustrated with drawings of the Planets, Comets, Solar Spots, &c.

A few facts connected with the Elements of Clock and Watchmaking; By Charles Frodsham. Second Edition. This little pamplet contains a quantity of information, very useful to any one interested in the important matter of time regulators; and therefore specially so to observers. We are glad to find that Mr. Frodsham intends to bring together his thirty years experience, in order to its publication.

NOTES AND GLEANINGS.

Comet IV, 1863.—The following positions of this telescopic Comet are by Romberg :—

	R. A.			Decl.		
1863.	H.	M.	S.	°	′	BRIGHTNESS.
Dec. 2.	14	39	1	+ 46	36·2	3·80
4.	14	55	15	46	23·9	
6.	15	11	11	46	4·8	
8.	15	26	45	45	39·7	3·90
10.	15	41	50	45	8·7	
12.	15	56	25	44	32·7	
14.	16	10	23	43	52·6	
16.	16	23	43	+ 43	8·6	3·72

The Comet attains its maximum brilliancy on about December 8th.

Another Comet was discovered at Marseilles, by M. Tempel, on November 4th. It is visible to the naked eye, shining as a star of Mag. 4, with a tail of two degrees in Boötes. Further particulars in our next. [In a note to the *Times*, Mr. Hind states, that this Comet would be near Eta Boötes on the 24th November, and just north of Arcturus on the 26th. That its nucleus was nearly stellar, and that it bore higher powers than usual.]

THE PLANET MARS.—As it is very desirable that the numerous drawings of this Planet, taken at its opposition in 1862, should be brought together for comparison, so that one may confirm the other, as it were, with regard to the permanent markings, and the gaps in the series of one observer be filled up by another, we are preparing blank forms for the purpose (similar to those prepared for Jupiter), and shall be glad to supply them to those who may be willing to co-operate in this matter. Besides the admirable drawings of Mr. Lockyer, Mr. Phillips, and others, already exhibited at the Royal, and the Astronomical Societies, there are numerous sets taken by amateur Astronomers well worthy of comparison with them. Two excellent series are now before us—the one by Mr. W. L. Banks, of Ealing, the other by Mr. N. Green, of Kilburn, and many others are in existence, which may be rendered of permanent use to the science by the carrying out of some such arrangement as this.

THE PLANETS FOR DECEMBER.

Mercury is in superior conjunction with the Sun on the 1st of December, and may be seen as an evening star towards the end of the month, but having great southern declination, it is not very favourably situated. It then sets about an hour and a quarter after the Sun and is in the constellation Scorpio.

Dec. 1st.	R. A. 16 26 51	Dec. S. 22 33½	Diameter	4″·4.
31st.	19 52 30	„ 22 55	„	5″·4.

Venus is most brilliant as a morning star, passing from Virgo to Libra during the month; it rises at a quarter past three on the 1st, and a few minutes after four on the last day.

Nov. 1st.	R. A. 13 25 30	Dec. S. 6 44	Diameter	26″·4.
31st.	15 28 56	„ 15 39½	„	19″·4.

Illuminated portion of the disc of Venus 0·533.

Jupiter continues in the constellation Libra, and may be seen in the early mornings, rising about half-past five on the 1st, and about four o'clock on the last day of the month. The Satellites cannot yet be well observed.

Dec. 1st. R. A. 14 49 6 Dec. S. 15 15½
31st. 15 12 34 „ 16 53

Saturn rises about half-past two in the morning on the 1st, and about ten minutes to one o'clock on the last day of the month, continuing in the constellation Virgo.

Dec. 1st. R. A. 13 0 7 Dec. S. 3 55½ Diameter 15″·0
31st. 13 8 0 „ 4 36½ „ 15″·6
Dimensions of Ring—Outer Major Axis, 38″. Outer Minor Axis, 7″.

Uranus is in opposition to the Sun on the 15th, and therefore most favourably situated for observation.

Dec. 3rd. R. A. 5 32 8 Dec. N. 23 26½ Diameter 4″·2
31st. 5 26 39 „ 23 23

Neptune passes the meridian between six and seven in the evenings at the beginning of the month, and as the planet is equal to an eighth magnitude star, may be well seen in a moderate transit instrument. We have given the mean time of the transit and declination in the Table of Astronomical Occurrences.

Dec. 3rd. R. A. 0 14 38 Dec. S. 0 1¼
31st. 0 14 45 „ 0 0½

THE MINOR PLANETS.

The following are the Minor Planets which will be on, or within one hour of Right Ascension on either side of the Meridian, between 9 and 12 o'clock during the evenings of December. Their places are to be found in the Supplement to the Nautical Almanac for 1866.

	Magnitude.		Magnitude.
Vesta	7·2	Eugenia	11·3
Hebe	7·8	Aglaia	11·8
Hygeia	10·3	Pales	9·5
Parthenope	9·9	Alexandra	11·4
Melpomene	8·4	Pandora	10·4
Pomona	11·0	Ausonia	10·7
Leucothea	13·0	Leto	10·5
Lætitia	9·1		

ASTRONOMICAL OCCURRENCES FOR DECEMBER, 1863.

DATE.		Principal Occurrences.		Jupiter's Satellites.		Meridian Passage.
		h. m.			h. m. s.	h. m.
Tues	1	 11 3	Sidereal Time at Mean Noon, 16 39 23·1 Superior Conjunction of Mercury			Neptune. — 7 34·0
Wed	2		Declination of Neptune, −0° 1′ 16″	2nd Ec. D.	18 12 7	7 30·0
Thur	3	0 14	Moon's Last Quarter			7 26·1
Frid	4	11 20	Conjunction, Jupiter and a^2 Libræ, 8m·7 W.	1st Tr. I. „ Sh. E.	17 54 19 33	7 22·1
Sat	5	23 59	Conjunction of Moon and Saturn, 6° 10′ N.	1st Oc. R.	17 18	7 18·2
Sun	6	21 27	Conjunction of Moon and Venus, 5° 15′ N.			7 14·2
Mon	7		Declination of Neptune, −0° 1′ 45″			7 10·3
Tues	8	2 49 16 53 21 49	Conjunction, Moon and Jupiter, 2° 5′ N. Conjunction, Moon and Mars, 0° 27′ N. Greatest Westerly Elongation of Venus, 46° 49′			7 6·4
Wed	9			3d Oc. R.	17 14	7 2·5
Thur	10	8 23 12 49 17 5	New Moon Conjunction of Venus and Kappa Virginis, 3m·7 E. Conjunction of Moon and Mercury, 3° 59′ S.			6 58·5
Frid	11			2nd Sh. E. „ Tr. E. 1st Sh. I. „ Tr. I.	17 26 18 47 19 14 19 54	6 54·6
Sat	12			1st Oc. R.	19 18	6 50·6
Sun	13		Declination of Neptune, −0° 1′ 52″			6 46·7
Mon	14					6 42·7
Tues	15	0 16 10 3	Opposition of Uranus Occultation disappearance of 44 Aquarii (6)			Moon. — 4 24·2

DATE.		Principal Occurrences.		Jupiter's Satellites.		Meridian Passage.
		h. m.			h. m. s.	h. m.
Wed	16	 23 46	Sidereal Time at Mean Noon, 17 38 31·4 Moon's First Quarter	3d Ec. R. ,, Oc. D.	18 26 14 19 23	Moon. — 5 15·3
Thur	17	3 30 4 0	Occultation of 22 Piscium Reappearance of do. (6)			6 4·7
Fri.	18			2nd Sh. I. ,, Tr. I. ,, Sh. E.	17 40 19 12 20 2	6 53·6
Sat.	19	4 29 5 13	Occultation of π Piscium Reappearance of do. (6)	1st Ec. D.	18 20 41	7 42·5
Sun	20			1st Sh. E. ,, Tr. E.	17 48 18 36	8 32·0
Mon	21					9 22·3
Tues	22					10 13·1
Wed	23	4 5 4 52 18 34	Occultation of *l* Tauri (5½) Reappearance of ditto Conjunction of Moon and Uranus, 2° 21′ N.			11 3·9
Thur	24	5 38 6 38 10 44 14 50	Occultation of χ^4 Orionis Reappearance of do. (5) Near approach of Moon to 68 Orionis (6) Full Moon			11 53·9
Fri.	25					Uranus — 11 12·1
Sat	26	12 38 13 57 14 55	Occultation of 1 Cancri (6) Reappearance of ditto Conjunction of Jupiter and Venus, 1° 59′ N.			11 8·0
Sun	27	11 35 12 54 14 38 15 45	Occultation of A^1 Cancri Reappearance of ditto Occultation of A^2 Cancri Reappearance of ditto	1st Sh. I. ,, Tr. I. 2nd Oc. R. 1st Sh. E.	17 29 18 22 19 13 19 41	11 3·9
Mon	28	10 59 12 13	Occultation of ω Leonis (6) Reappearance of do.	1st Oc. R.	17 47	10 59·8
Tues	29					10 55·7
Wed	30	10 13 10 31 14 49 16 8	Occultation of 55 Leonis (6) Reappearance of ditto Occultation of p^2 Leonis (6) Reappearance of do.			10 51·6
Thur	31					10 47·5

TABLE OF NEBULÆ.

Right Ascension, Two Hours.

NAME OF NEBULA	Right Ascension.	Declination.
19 Hersc. v. Andromedæ Excessively faint—practically invisible.	2 14 10	+41 43
23 Hersc. IV. Ceti .... A Planetary Nebula, pale and indifferently defined.	2 20 40	− 1 45
156 Hersc. I. Persei ...... Small, but moderately bright, like a minute star in a haze.	2 32 0	+38 26½
77 M. Ceti.................. A curious and interesting Stellar Nebula.	2 35 45	− 0 34½
64 Hersc. I. Ceti .... Pale, with no nucleus, but a slight condensation.	2 39 20	− 8 8½

Of our five Nebulæ in the second hour of Right Ascension, the third and fourth only will repay the amateur for the trouble of observing them. 155 Hersc. I. Persei is tolerably bright, and looks, as we have said above, something like a very small star in a haze. It may be recognised by being found just north of a pretty field of little stars, somewhat sesembling the constellation Corona Borealis in their configuration. 77 M. Ceti is the north preceding star of a pair, and apparently forms the nucleus of the nebulosity which surrounds it.

Gamma Andromedæ.—On Nov. 12th the following results were obtained by the Rev, W. R. Dawes with a filar micrometer, on Alvan Clark's 8¼in. Refractor :—

$$A \ \& \ \frac{B+C}{2}$$

P=64°·20; obs. 5; w. 46: D=10″·470; obs. 6; w. 31.

B & C

P=107°·70; obs. 5; w. 38: C=0″·588; obs. 6; w. 44.

B & C clearly divided with power 480; B, greenish yellow : C, bluish green.

Variable Star.—Mr Baxendell has forwarded to us the following positions of the star T Aquilæ, the variability of which was discovered at Mr Worthington's Observatory, July 28, 1863 :—

1865·0 R.A. 20h. 5m. 20s·4 Decl. +15° 13′·4

Period, about 4 months : minimum, August 24, 1863, =11·3 magnitude; maximum, October 25, 1863, =8·9 magnitude.

In the 2nd Hour of Right Ascension, two of the most remarkable Variable Stars in the heavens are to be found. The first of those, *o* Ceti, or *Mira*, (R.A. 2h. 12m. 30s., Decl. −3° 35′) varies from the 2nd to the 7th magnitude in a period of 331½ days; while the second, β Persei, or *Algol*, (R.A. 2h. 59m. 20s., Decl. +40° 26′) has a period of 2 days, 20 hours, 48·9 minutes, changing from the 2nd to the 4th magnitude in *three hours and a half*, and returning in the same time to the 2nd magnitude again, at which it continues during the remainder of its period. We may add that it was in this same hour of Right Ascension that a new star appeared in the constellation *Cassiopea* in the year 1572, which increased until it surpassed Sirius in brilliancy, and was even visible in the day time. It diminished gradually until March 1574, when it disappeared, and has not been seen since. Tycho Brahe, Kepler, and others, wrote dissertations upon it, and Sir J. Herschel thinks it possible that it may return in 1872.

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We are again compelled to postpone several communications for want of space.——The letter from Mr Hunt in our next.

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CONTENTS.

Page
To our Readers 181
Meeting of the Royal Astronomical Society, November 13 182

Correspondence :

Joshua commanding the Sun to stand still——Biblical Astronomy ——The Parallactic Ladder——Planetary Conjunctions——Occultation——Double Star in Orion——Visibility of the dark side of Venus——The New Astronomical Society—The Rev. T. W. Webb's Catalogue 186
Suggestions and Enquiries 192
Literary Notices ... ...

Notes and Gleanings :

Comet IV. 1863——Another Comet——The Planet Mars 193
Positions of the Planets 195
Astronomical Occurrences for the Month 196
Table of Nebulæ 198
Gamma Andromedæ 198
Variable Stars 198
Instruments for Sale, &c., ... 199
To Correspondents 200
List of Subscribers... 200
Advertisements 200

LONDON: Private Press—Observatory, Downs Road, Clapton.

ON THE

METHOD OF OBSERVING

VARIABLE STARS.

BY

GEORGE KNOTT, LL.B. LOND., F.R.A.S.

AND

JOSEPH BAXENDELL, F.R.A.S., ETC.

LONDON:
Printed for Private Circulation.
MDCCCLXIII.

HARRILD, PRINTER, LONDON.

PREFACE.

IN the following pages an attempt has been made to give a practical account of the method of observing variable stars, and of reducing and discussing the observations when obtained. Little or no reference has been made to what may be termed the literature of the subject, from the conviction that such reference would tend rather to embarrass than to assist the reader.

The first part of what follows treats of the making and reducing observations of variable stars, with the view of determining the epoch of *maximum* or *minimum*. Mr. Baxendell has kindly added a note on the "Light-ratio," and a valuable account of the application of the *method of least squares* to the determination of the most probable *period* of a variable star, in regard to which I will only say that I hardly know where to look for the like information.

Observers will be glad to learn that there is the prospect of a speedy removal of one great obstacle to the general prosecution of this branch of research, viz., the want of charts and lists of comparison stars, by the publication, in five parts, of the "Hartwell Variable Star Atlas," one part of which, containing the charts for the variables between 11h and 17h of Right Ascension, will, it is hoped, be completed in the course of the present year.

G. K.

WOODCROFT OBSERVATORY, CUCKFIELD,
August, 1863.

ON THE METHOD OF MAKING AND REDUCING OBSERVATIONS OF VARIABLE STARS.

BEFORE proceeding to give an account of the method of observing variable stars, it will be desirable to offer a few remarks on a subject closely connected with it, namely, that of star magnitudes.

The division of the stars into classes, or magnitudes,* as they are technically called, though a convenient, or even, perhaps, a necessary one, is nevertheless entirely artificial and arbitrary. Accordingly we find that astronomers have differed considerably in their nomenclature, more especially, however, in the lower telescopic magnitudes. Thus Sir John Herschel, with his 20-foot reflector, noted to the 20th magnitude; Admiral Smyth regarded the 16th magnitude as the *minimum visibile* of his 6-inch object-glass; while Professor Struve assigned the 12th magnitude as the limit of the great Dorpat Refractor of 9½ inches aperture, being guided to his choice by the consideration that the number of telescopic magnitudes would thus be equal to the number of magnitudes distinguishable by the unaided eye. Among the naked eye and higher telescopic magnitudes, the differences are not so striking, and there is so fair an accordance between the magnitude-estimates of several of the best meridian observers, that their results may be conveniently taken as the basis of a more extended scale, as has been done by the Rev. W. R. Dawes, F.R.A.S., by the late M. J. Johnson, Esq., F.R.A.S., Radcliffe Observer, and by the present Director of the Royal Observatory at Madras, N. R. Pogson, Esq., F.R.A.S., to whose researches, as those of one of our first authorities on the subject of variable stars, we shall presently more particularly refer.

In determining star magnitudes, it would clearly be of great advantage if we could avail ourselves of some contrivance, or method of observation, applicable alike to naked eye and telescopic stars, to assist the eye in its estimates. Two methods have been adopted for this purpose. The one, first employed by Sir W. Herschel, and afterwards, in a modified form, by Mr. Johnson, requires two telescopes, or a telescope with a divided object-glass. The other, which is more simple and manageable, and is the one now generally used for telescopic stars, is termed the method of "limiting" or "reduced" apertures, a method for the first systematic application of which we are indebted, so far as I am aware, to our accomplished observer, the Rev. W. R. Dawes, an interesting account of whose investigations will be found in the "Monthly Notices of the Royal Astronomical Society," vol. xi. p. 187.

---

* This term is rather an unfortunate one, but has now acquired a purely conventional signification. It is apparently merely a translation of the Greek word μέγεθος, which is found in Ptolemy's Catalogue in this connection. Whatever idea may have primarily attached to the term, relative *brightness*, or *magnitude*, cannot now be regarded as necessarily associated with relative *size*.

This method consists in contracting the aperture of a telescope, by a circular diaphragm placed in front of the object-glass; and as the quantity of light transmitted by a telescope varies as the square of its aperture, the relative brightness of two stars will be inversely proportional to the square of the diameter of the diaphragm which suffices to render each star just steadily visible, or, as is perhaps more certainly observable, which suffices just to extinguish each.

Before we can apply this method to the determination of star magnitudes, *two constants* must first be fixed:—1st, the aperture with which a star of any given magnitude may be just perceived, or the aperture which just extinguishes it, if that method be preferred; and 2nd, the *light-ratio*, or the proportion existing between the amount of light received from two stars differing in brightness by *one whole magnitude*. These two constants being fixed, we can at once construct a table of corresponding magnitudes and apertures. We may just remark, however, with regard to these constants, that two methods are open to us: either we may arbitrarily assign numerical values to them, and then construct a theoretical magnitude scale; or we may experimentally determine them by a course of observations on a list of stars selected from one or more standard catalogues. The latter method evidently possesses many advantages, and was that adopted by the Rev. W. R. Dawes, and afterwards by Mr. Johnson, and by Mr. Pogson. We now proceed to give an account of Mr. Pogson's researches in his own words, extracted from the "Monthly Notices R. A. S.," vol. xvii. p. 14.

"Instead of reducing stars to a *minimum visibile*, their total "extinction was preferred as more certain. Having found by trial "the apertures with which certain stars of assumed magnitude

" were lost sight of, these measures were grouped together and
" submitted to the formula*

$$(M - m) \log R = 2 (\log A - \log a)$$

" in which R is the required *light-ratio*; M, m, the magnitudes of
" stars as widely different as possible, and A, a, the respective
" apertures with which each star vanished. The assumed magni-
" tudes were taken from the *Radcliffe Observations*, from the Zones
" of Argelander and Bessel, and from the catalogues of Piazzi,
" Lalande, and Groombridge, so as to find the ratio of each observer
" separately. The ratios thus found were remarkably accordant:
" the mean of all 2·4." After remarking on the close agreement
of this value with the determinations of several other observers,
whom he names, Mr. Pogson goes on to say:—" It signifies little
" which of these ratios is adopted in dealing with the ranges of
" ordinary telescopes. I selected 2·512 for convenience of cal-
" culation, as the reciprocal of ½ log R, a constant continually
" occurring in photometric formulæ, is in this case exactly 5. If
" then any observer will determine for himself the smallest of
" Argelander's magnitudes, just discernible by fits, on a fine
" moonless night, with an aperture of one-inch, and call this
" quantity L, or the limit of vision for one-inch, the limit l, for
" any other aperture, will be given by the simple formula †
" $l = L + 5 \times \log$ aperture." Mr. Pogson's own value for L is
9·2, and probably in the majority of cases this value may be
adopted by other observers without the risk of any very serious
error. It would, however, be more satisfactory for each observer

---

* If M, m, be the magnitudes of two stars, and A, a, the corresponding limiting apertures, M and A being respectively numerically greater than m and a, the ratio of the light received from the mth mag. star will be to that received from the Mth mag. star as A^2 to a^2. Also if R be the ratio of the light received from any star to that received from any other star one whole magnitude less than the first, then the ratio of the light received from a star of the mth mag. to that received from a star of the Mth mag. will equal R^{M-m}. Hence $R^{M-m} = \frac{A^2}{a^2}$; or, taking logs of both sides $(M - m) \log R = 2 (\log A - \log a)$, which determines R. (G. K.)

† As before, if A, a, be the limiting apertures for two stars differing by n magnitudes, $R^n = \frac{A^2}{a^2}$. But in this case the value of a is unity, hence $R^n = A^2$; or, taking logs, $n \log R = 2 \log A, \therefore n = \frac{2 \log A}{\log R} = \frac{\log A}{\frac{1}{2} \log R}$. And, since $\frac{1}{\frac{1}{2} \log R}$ is exactly 5, we have $n = 5 \log A$; therefore the magnitude of any star = mag. corresponding to unit of aperture + 5 log star's limiting aperture; $\therefore l = L + 5 \log$ aperture. (G. K.)

to determine the value of this constant for himself by careful experiment.

We now proceed to our more immediate object. Preparatory to commencing operations on a variable star, it is requisite that the observer should be furnished with a chart of its neighbourhood, together with a selected list of conveniently situated "comparison stars," whose magnitudes have been carefully determined, to be used as points of reference in fixing the magnitude of the "variable," at the several dates of observation. The "comparison stars" in the list should be lettered or numbered, for convenience of reference, corresponding letters or numbers being affixed to them on the chart.

Thus furnished, the observer compares the "variable" with two or more of the stars on his list, which differ least from it in brightness, and carefully estimates the differences in tenths of a magnitude, being guided in his estimations by reference to the known differences of the comparison stars. He thus obtains several more or less independent values for the magnitude of the "variable" at the date of observation, the mean of which (and after a little practice they will be found to be fairly accordant) is adopted as the magnitude for the night, with every probability of its being not far from the truth.

It will at once be seen that, in adopting this method of observing, we eliminate one very serious disturbing cause, which largely affects the exact determination of star magnitudes, namely, the unequal transparency of the atmosphere on different evenings. By the use of comparison stars we, in great measure, if not entirely, free ourselves from this difficulty, as cloud, mist, or moonlight would similarly affect both them and the "variable." In regard to estimation of tenths of a magnitude no certain rule can be given. With practice the eye becomes more and more sensitive to minute differences of light, but it is only by continued observation that facility or confidence in this particular can be acquired. We may, however, remark that any error in the determination of the magnitude of a variable star in this way will not be magnified, but the contrary, in the further steps of the process.

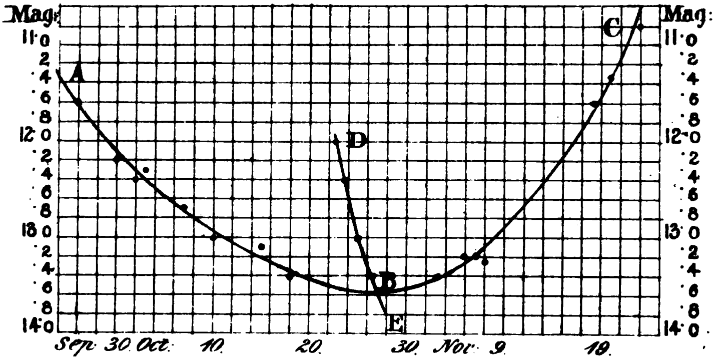
An example, selected from observations of the variable star R Vulpeculæ, will illustrate the preceding remarks.

Nov. 27, 1861. Telescope employed, 7½-inch equatoreal, magnifying power 60. R Vulpeculæ nine-tenths of a magnitude less than comparison star c, three-tenths less than f, two-tenths brighter than g, four-tenths brighter than k, eleven-tenths brighter than m. The adopted magnitudes of the comparison stars are as follow:—$c = 9{\cdot}5$, $f = 9{\cdot}8$, $g = 10{\cdot}6$, $k = 10{\cdot}6$, $m = 11{\cdot}5$; and hence the values for the magnitude of the "variable" on the night in question are—10·4, 10·1, 10·4, 10·2, 10·4; the mean being 10·3, which is therefore assumed as the magnitude for the night.

And here a few words may be offered on the mode of entering the light-estimates in the observation book. Following Mr. Pogson, I have myself made use of the signs $+$ and $-$, and should enter the above cited estimates thus:—R Vulpeculæ $= c + 9 = f + 3 = g - 2 = k - 4 = m - 11$; where the symbols $+$ and $-$ indicate the *sign* of the numerical correction to be applied to the magnitude of the comparison star to reduce it to that of the variable. It must be confessed that this method is slightly equivocal, because, from the fact of a *higher* number standing for a *lower* magnitude, $c + 9$ in this nomenclature does not mean nine-tenths *brighter* than c, but nine-tenths *less* than c. Instead of the above, Mr. Baxendell employs the symbols $>$ and $<$, *i.e.*, "greater than" and "less than," which are certainly less liable to be mistaken. On this system the above light-estimates would stand:—R Vulpeculæ $9 < c$; $3 < f$; $2 > g$; $4 > k$; $11 > m$. It must, however, be left to the observer to choose his mode of entry; but in communicating his observations to others, it is of the utmost importance that he should carefully explain the method he has adopted.

Having collected a sufficiency of observations, the next step in the process is to project them on cross-ruled paper, taking the dates of observation for abscissæ, and the corresponding mean magnitudes for ordinates. A series of points is thus laid down, and a curve is then drawn by hand evenly *among* them, so as to leave as few discordances as possible. This is termed the "light-curve," and serves to determine the *maximum* or *minimum* of the "variable," as shown by the date on which the curve passes through its highest or lowest point. If the change of magnitude is slow, and the light-curve consequently much flattened near the vertex, the epoch of maximum or minimum cannot accurately be determined by mere inspection. In such cases the following expedient has been suggested by Mr. Pogson. Bisect the straight lines joining points where the curve in rising and falling passes through *equal magnitudes*. If the curve were symmetrical on each side of the vertex these points of bisection would lie on a *straight* line, but as, in the majority of instances, this is not the case, on account of the unequal rapidity with which the "variable" increases and decreases, a line drawn among them will be more or less *curved*. The point where this line, if produced, cuts the light-curve is assumed as the epoch of maximum or minimum, as the case may be.

The accompanying diagram will, it is hoped, sufficiently illustrate the preceding paragraph. It represents a portion of the light-curve of the variable star R Vulpeculæ, near the minimum which occurred in the autumn of the year 1861.



PORTION OF LIGHT-CURVE OF
R. Vulpeculæ.

A B C is the "light-curve" drawn *among* the dots which represents the projections of the following observations:—

Date of Obs.	Mean Mag.	Date of Obs.	Mean. Mag.
Sept. 26	11·6	Oct. 26	invisible.
„ 30	12·2	Nov. 2	13·4
Oct. 2	12·4	„ 5	13·2
„ 3	12·3	„ 6	13·2
„ 7	12·7	„ 7	13·3
„ 10	13·0	„ 18	11·6
„ 15	13·1	„ 20	11·3
„ 18	13·4	„ 23	10·8

The short line D B E is the line drawn *among the points of bisection* of lines of equal magnitudes, in the manner before described, for the purpose of fixing the vertex of the curve, which in this case determines the epoch of *minimum*. A glance at the diagram will show that the minimum occurred on the 27th October, and that the magnitude of the "variable" at that date was 13·6.

By way of conclusion to this part of the subject, we propose to give a few practical hints relative to the recording and reducing of observations.

First, as it is desirable that the observations should be systematically recorded, it is recommended that each observer should keep a book specially for his variable star observations. This book may, with advantage, be ruled so as to contain columns for the following particulars, which should form a part of each entry:—the date of observation; the name of the star observed; the size of the telescope with which the observation is made; the magnifying power employed; the light estimates; the resulting magnitudes; and finally, a column for "Remarks," which may be of use for the entry of the *colour* of the "variable," general estimate of the observations, state of the atmosphere, etc.

Secondly, with regard to the light curve. It is desirable that a separate book for each star should be kept for the entry of the light co-ordinates—viz., the dates of observation, and the corresponding mean magnitudes. In this book may also be entered the times of maximum and minimum, as deduced from the observations. For projecting the light-curve it is recommended that a scale of *half an inch* to *one* magnitude, and *half an inch* to *ten* days should be generally adopted. Cross-ruled paper may be purchased admirably adapted for the purpose. The most convenient perhaps is that ruled with ten lines to the inch; one horizontal division will then represent two days, and one vertical division two-tenths of a magnitude.

Lastly, it is desirable that, for some little time at least, the observer should periodically transmit to head-quarters a report of his observations, containing the dates of observation and the deduced magnitudes, so that by a comparison of the results of several observers, some idea may be formed of the habit of observing in each case, and that the most probable times of maxima and minima may be deduced from a combination of the results obtained by several individuals.

NOTE

ON THE LIGHT-RATIO AND THE LIMITING APERTURE FOR A GIVEN MAGNITUDE.

BY MR. BAXENDELL.

THE values of the limiting aperture for a given magnitude, and of the light-ratio, obtained by different observers, differ more than might have been expected. Thus the limiting-aperture for an average sixth-magnitude star was found by the Rev. W. R. Dawes and Mr. Lassell to be 0·15 in.; by Mr. Pogson, 0·23 in.; and by myself, 0·14. The "ratio of light" derived by Mr. Dawes from observations of 187 stars between the 6th and 9th magnitudes, taken from Bessel's and Argelander's zones, was 4·00. Mr. Johnson and Mr. Pogson, from experiments with the heliometer of the Radcliffe Observatory, Oxford, on stars between the 4th and 10th magnitudes, obtained a mean ratio of 2·36. Mr. Carrington found that a ratio of 2·75 best represented his results; while my own experiments on stars between the 6th and 9th magnitudes gave a ratio of 2·92. The results for naked-eye stars are more accordant. Sir W. Herschel's experiments on stars from the 1st to the 6th magnitudes give the ratio 2·61; Sir John Herschel, employing a wholly different method of observation, obtained results from stars between the 1st and 3rd magnitudes which give the ratio 2·47; and "from some experi-"ments made with apertures of various sizes, he was led to believe "that the actual ratio of the light of a star of the 1st magnitude "to one of the 6th, is at least 100 to 1." This result gives a light-ratio of 2·512, or precisely that which Mr. Pogson has since recommended for general adoption on account of its convenience in photometric computations.

From the discordant values of the light-ratio derived from observations of telescopic stars by different observers, as given above, it might at first sight be supposed that little reliance could be placed upon photometrical determinations of star magnitudes; but it must be borne in mind that the number of stars used in the determination of each of these values is but an exceedingly small fraction of the total number of catalogued stars; and that the differences between the assigned magnitudes of stars having the same brightness frequently amount to more than a whole magnitude; and in fact experience has shown that the results obtained by a careful use of the method of limiting apertures on the *same* stars, by different observers, are remarkably accordant. The importance of using the same light-ratio for both naked-eye and telescopic stars in variable star investigations need not be urged; and it is manifestly desirable that the light-ratio which is based upon the generally received magnitudes of the stars which are visible to the naked eye should be preferred, namely, 2·512.

METHOD OF DETERMINING THE MOST PROBABLE VALUE OF THE MEAN PERIOD OF A VARIABLE STAR.

BY JOSEPH BAXENDELL, F.R.A.S., ETC.

HAVING obtained a series of observed maxima or minima of a variable star, and a rough approximation to the length of its period, a table must be formed, in which the first column will contain the observed times of maxima or minima; the second, the intervals in days between these times; the third, the number of periods in the intervals; the fourth, the number of periods from the date of the first maximum or minimum, or from any other convenient epoch; and the fifth, the number of days from this epoch.

Taking the means of the numbers in columns four and five, and representing the most probable value of the mean period by P, a series of equations must be constructed of the form—

$$\begin{aligned} a\,\mathrm{P} &= r \\ b\,\mathrm{P} &= s \\ c\,\mathrm{P} &= t \\ \text{etc.} &\quad \text{etc.} \end{aligned}$$

in which the co-efficients of the left-hand members will be the differences between each of the numbers in column *four* and their mean value; and the right-hand members the corresponding differences between each of the numbers in column *five*, and their mean value. Multiplying each of these equations by the coefficient of its left-hand member, and taking the sum of all the resulting equations, we have—

$$(a^2 + b^2 + c^2 + \dots)\,\mathrm{P} = ar + bs + ct + \dots$$

$$\text{and } \mathrm{P} = \frac{ar + bs + ct + \dots}{a^2 + b^2 + c^2 + \dots}$$

If the number representing the mean of column *four* is a whole number, then the mean of column *five* will be the mean epoch of maximum or minimum; but if the former number is affected by a fraction, then the mean epoch of maximum or minimum will be obtained by simply deducting an equivalent fraction of the mean period from the mean of column *five*.

The following example will show the application of this method :—

R ARIETIS.

Observed Times of Maxima.	Intervals in Days.	Number of Periods in the Interval.	Number of Periods from the first Maximum.	Number of Days from the first Maximum.
1858, January 2	0	0	0	0
1859, January 5	368	2	2	368
„ July 17	193	1	3	561
1860, January 18	185	1	4	746
1861, January 5	353	2	6	1099
1862, January 24	384	2	8	1483
1863, February 3	375	2	10	1858
Means ...	...	...	$4\frac{5}{7}$	873·57

Representing the mean period by P, and taking the differences between the numbers in columns four and five and their mean values, we have—

$$\begin{aligned}
4\tfrac{5}{7}\ P &= 873{\cdot}57\\
2\tfrac{5}{7}\ P &= 505{\cdot}57\\
1\tfrac{5}{7}\ P &= 312{\cdot}57\\
0\tfrac{5}{7}\ P &= 127{\cdot}57\\
1\tfrac{2}{7}\ P &= 225{\cdot}43\\
3\tfrac{2}{7}\ P &= 609{\cdot}43\\
5\tfrac{2}{7}\ P &= 984.43
\end{aligned}$$

Multiplying each of these equations by *seven*, in order to get rid of the fraction in the co-efficient of the left-hand member, we obtain—

$$\begin{aligned}
33\ P &= 6114{\cdot}99\\
19\ P &= 3538{\cdot}99\\
12\ P &= 2187{\cdot}99\\
5\ P &= 892{\cdot}99\\
9\ P &= 1578{\cdot}01\\
23\ P &= 4266{\cdot}01\\
37\ P &= 6891{\cdot}01
\end{aligned}$$

Multiplying each of these equations by the co-efficient of its left-hand member, we have—

$$\begin{aligned}
1089\,P &= 201794{\cdot}67 \\
361\,P &= 67240{\cdot}81 \\
144\,P &= 26255{\cdot}88 \\
25\,P &= 4464{\cdot}95 \\
81\,P &= 14202{\cdot}09 \\
529\,P &= 98118{\cdot}23 \\
1369\,P &= 254967{\cdot}37
\end{aligned}$$

Adding together these equations, we have the final equation:

$$3598\,P = 667044{\cdot}00$$

$$\text{or } P = \frac{667044}{3598} = 185{\cdot}39 \text{ days.}$$

Deducting *five-sevenths* of 185·39 days, = 132·42 days, from 873·57 days, the mean of column *five*, we have 741·15 days, which, reckoning from the date of the first maximum, gives the

Mean epoch = 1860, January 13·15.

If now with the elements—

Epoch = 1860, January 13·15,
Period = 185·39 days,

we calculate the times of maximum, we shall obtain the following differences between the calculated and observed times—

Calc.—Obs.
— 0·41
+ 2·37
— 5·24
— 4·85
+ 12·93
— 0·29
— 4·51

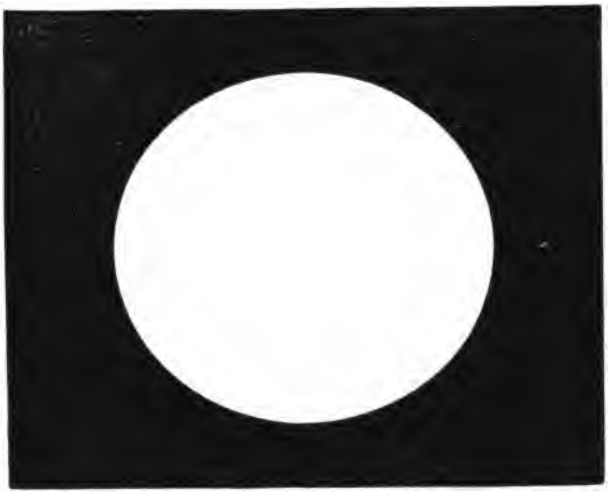
It will be found, on trial, that the sum of the squares of these differences is less than will be obtained by using any other value for the mean period than 185·39 days; which, therefore, as it best represents all the observations, is the most probable value.

HARRILD, PRINTER, LONDON.

JUPITER.

Observed at

186 G. M. T.



Power used

Remarks:—